Journal of the Society of Arts.

FRIDAY, MARCH 22, 1861.

INTERNATIONAL EXHIBITION OF 1862.—GUARANTEE DEED.

The Council beg to announce that the Guarantee Deed is now lying at the Society's House for signature, and they will be much obliged if those gentlemen who have given in their names as Guarantors, as well as others who take an interest in the Exhibition, will make it convenient to call there and attach their signatures to the Document. Signatures for sums amounting in the aggregate to £327,150, have already been attached to the Deed.

GUARANTEE FUND FOR THE EXHIBITION OF 1862.

The following additions have been made since the last announcement in the *Journal* for March 15:—

*** *The names marked with an asterisk are those of Members of the Society of Arts.*

NAME.	AMOUNT.	REPRESENTING THE OBJECTS OF THE SOCIETY—ARTS, MANUFACTURES, AND COMMERCE.
Lewis D. B. Gordon, 14, Abingdon-street	£1,000	Arts.
Morton Edwards, 5, George-street, Hanover-square	100	Arts.
Jas. Valentin, Shen Lodge, Walthamstow	200	Arts.
Wm. Paul Metchim, 20, Parliament-street, S.W.	100	Arts.
*Prior Purvis, M.D., Blackheath	100	Arts.
Stuart Knill, The Crossletts in the Grove, Blackheath	250	Arts.
Geo. Hibbert, 21, Queen-street, Mayfair, W.	500	Commerce.
Harry Privett, 47, Brewer-street, Golden-square, W.	100	Commerce.
G. W. M. Henderson, 103, Eaton-place, S.W.	500	Arts.
George Bin, 38, Edgware-road, W.	500	Commeree.
Levin Levi (Lee, Bros.), 27, Wood-street, E.C.	100	Commerce.
Geo. Humby, 2, Aberdeen-place, N.W.	100	Arts.
Jos. T. Younghusband, 53, Clefton-road, St. John's-wood, N.W.	500	Arts.
Charles Hill, 29, Threadneedle-street, E.C.	300	Commerce.
Richard Gunter, Lowndes-street, Lowndes-square, S.W.	300	Commerce.
Middleton and Answorth, Norwich	100	Manufactures.
James Holroyd (Holroyd, Bros., and Co.), 66, Basinghall-street, E.C. ...	300	Commerce.
Henry Johnson (Mayor of Stamford)	100	Arts.
J. Richardson (Henri Patent Cattle Feed Co.), London-bridge, E.C. ...	100	Commerce.
Hinstin, Bros., 22, Milk-street, Cheapside, E.C.	150	Commerce.
Bonamy Dobree (Governor of the Bank of England), 1, Broad-sanctuary, Westminster, S.W.	500	Commerce.
Capt. Edward Walter, Army and Navy Club, S.W.	500	Arts.
John Morgan, Amen-corner, E.C.	100	Commerce.
Fredk. George Underhay, Arundel-square, Barnsbury, N.	100	Arts.
Henry White, 5, Queen-street, E.C.	100	Commerce.
Major-General Edward Macarthur, 134, Piccadilly, W.	1,000	Arts.
Geo. Robt. Smith, 73, Eaton-square, S.W.	500	Arts.
Robt. Goulding Ledger, St. John's, Southwark, S.	100	Commerce.
Metzler, Geo. (Metzler and Co.), 37, Great Marlborough-street, W.... ...	300	Manufactures.
Silas Edward Martyn, 46, Thurlow-square, S.W.	200	Arts.
David Morgan Jones, (John Morgan and Co.,) Amen-corner	100	Commerce.
Charles Farron, (Farron and Jackson,) 18, Great George-street, E.C. ...	100	Commerce.
Victor Barrer, 1, Ironmonger-lane, E.C.	100	Commerce.
Charles Clark, Mayor of Wolverhampton	100	Commerce.
Stephen Cave, M.P., 35, Wilton-place, S.W.	500	Arts.
Wm. H. Gore Langton, M.P., Clifton-court, Clifton, Bristol	500	Arts.
Edward Jones, Handsworth, near Birmingham	100	Commerce.
Samson Lloyd Forster, the Five Ways, Walsall	100	Commerce.
Henry William Hayes, (Hayes and Co.,) 4, Great Marlboro'.-street, W. ...	1,000	Commerce.
Henry Julius Leppoc, Manchester	100	Commerce.
Henry Samson, Manchester	100	Commerce.
William Armitage (Armitage and Rigbys), Manchester	500	Commerce.
*Marquis of Lansdowne, Lansdowne House, Berkely-square	1,000	Arts.
Richard Fisher, Medhurst	500	Arts.
*F. Burnett Houghton, 6, Clarendon-terrace, Kensington, W.	100	Arts.
*John Jeanes (Johnstone and Jeanes)	500	Manufactures.

NAME.	AMOUNT.	REPRESENTING THE OBJECTS OF THE SOCIETY—ARTS, MANUFACTURES, AND COMMERCE.
Edmund Johnson, 10, Castle-street, Holborn, W.C.	£100	Arts.
*Foster, Porter, and Co., 47, Wood-street, E.C.	1,000	Commerce.
John Hutchinson (Hutchinson and Earle), Widney, Lancashire	1,000	Commerce.
Derham, Brothers, Bristol	100	Commerce.
Robert Obbard, Blackheath	100	Commerce.
Wm. Golden Lumley, 10, Sussex-place, Regent's-park, N.W.	100	Arts.
Simon Abraham Kisch, 8, Lancaster-place, W.C.	100	Arts.
John Wallis, Wood-green, Tottenham	100	Arts.
William Callaghan, 23a, New Bond-street, W.	200	Commerce.
William Froggort, Manchester	100	Commerce.
William Phillip Phillips, (of W. P. and G. Phillips',) 155, New Bond-st., W....	500	Commerce.
George Phillips, (of W. P. and G. Phillips',) 359, Oxford-street, W. ...	500	Commerce.
James Chisholme Gooden, 33, Tavistock-square, W.	200	Arts.
John Browning, (Spencer, Browning and Co.,) Minories	250	Commerce.
John Cock, jun., Southmolton	100	Arts.
James Dundas, Dundas Castle, N.B.	100	Arts.
Michael Lewis Brown, 47, St. Martin's-lane, W.C.	100	Commerce.
Andrew Shanks, Robert-street, Adelphi, W.C.	250	Commerce.
Gilbert Greenall, Walton-hall) Warrington	500	Arts.
Sir Charles Rich, Bart., 12, Nottingham-place, N.W.	200	Arts.
J. and H. Brown and Co., Selkirk, N.B.	100	Commerce.
*C. W. Siemens, 3, Great George-street, Westminster	100	Arts.
William Willans, President of the Chamber of Commerce, Huddersfield ...	500	Commerce.
Thomas Mallinson, Huddersfield	500	Commerce.
Thomas Brooke, (John Brooke and Sons,) Huddersfield	1,000	Commerce.
Joseph Hirst, Huddersfield	500	Commerce.
*Charles Brook, Huddersfield	200	Commerce.
Joseph Wrigley, jun., (J. and T. C. Wrigley and Co.) Huddersfield ...	250	Commerce.
William Edwards Hirst, Huddersfield	250	Commerce.
Joseph William Walker, 27, Francis-street, Tottenham-court-road, W.C. ...	250	Commerce.
Hobbs, Ashley, and Co., 76, Cheapside	1,000	Commerce.
John Bazley White and Bros., Millbank-street, Westminster, S.W.... ...	500	Commerce.
Arnold Baruchson, 35, Dale-street, Liverpool	200	Commerce.
George Hawkins, 88, Bishopsgate-street Without, E.C....	200	Commerce.
Charles Gregory, 212, Regent-street, W.	500	Commerce.
C. Hindley and Sons, 134, Oxford-street, W.	1,000	Commerce.
Samuel Tillett, 6, Wellington-terrace, Bayswater, W.	100	Commerce.
George Dixon, Birmingham	100	Manufactures.
William Powell (John Hardman and Co.), Birmingham	500	Manufactures.
John Smith (Beckett and Co.), Bankers, Leeds	1,000	Commerce.
Wm. Bailey Holdsworth (W. B. Holdsworth and Co.), Hunslet, Leeds ...	100	Manufactures.
Andrew Fairbairn, Woodsley House, Leeds	500	Arts.
*John Corbett, The Stoke Works, near Bromsgrove	100	Manufactures.
Rev. Samuel Fisher, Hope Parsonage, Hanley	200	Arts.
William Ecroyd and Sons, Lomeshaye Mills, Burnley	300	Manufactures.
Joseph Lézard (Baume and Lézard), 21, Hatton-garden, W.C.	200	Commerce.
Thomas Glover, 8, Upper Chadwell-street, Pentonville, E.C.	1,000	Manufactures.
George Newen, 1, Hyde-park-terrace, W.	1,000	Arts.
James Edmeston, (Hon. Secretary of Architectural Exhibition,) 5, Crown-court, Old Broad-street, E.C.	100	Arts.
George Roberts, Provost of Selkirk	100	Arts.

BY ORDER,

P. LE NEVE FOSTER, *Secretary.*

INTERNATIONAL EXHIBITION OF 1862.

The Committee appointed to advise Her Majesty's Commissioners for the Exhibition of 1862, as to the period of Art to be represented at the forthcoming Exhibition, have held two meetings at the rooms of the Society of Arts. There were present—The Marquis of Lansdowne, K.G.; Earl Spencer; Earl Stanhope; Earl Somers: Lord Overstone; Lord Taunton; Lord Elcho, M.P.; Sir Stafford Northcote, Bart.; Sir Francis E. Scott, Bart.; Mr. Thos. Ashton; the Rev. E. Coleridge; Mr. Edwin Field; Mr. H. T. Hope; Mr. John Ruskin; Mr. W. Stirling, M.P.; Mr. S. J. Stern; Mr. Tom Taylor; Mr. W. Wells; Sir Charles Eastlake, President of the Royal Academy; Mr. Fred. Tayler, President of the Old Society of Painters in Water Colours; Mr. J. Y. Hurlstone, President of the Society of British Artists; Mr. Henry Warren, President of the New Society of Painters in Water Colours; and Professor C. R. Cockerell, R.A., President of the Institute of British Architects; attended by Mr. Le Neve Foster, Secretary to the Committee.

The following resolutions were passed:—

1. That the Exhibition ought not to be confined to the works of living artists.

2. That the object of the proposed Exhibition being to illustrate the progress and present condition of Modern Art, it be left to each country to decide under what

arrangements, and within what limits, that object can, in its own case, be attained, regard being had to the amount of space that can be devoted to its productions.

3. That as regards British Art, the above object will be fully attained by confining the Exhibition to the works of artists living at any period within the century preceding the Exhibition, *i.e.*, subsequent to the year 1762.

The Committee for advising her Majesty's Commissioners for the Exhibition of 1862, in reference to the formation of Trade and Local Committees, held their first meeting at the rooms of the Society of Arts yesterday. There were present :—The Marquis of Hartington, M.P.; the Lord Stanley, M.P.; the Lord Stanley of Alderley; the Right Hon. T. Milner Gibson, M.P., President of the Board of Trade; the Right Hon. Wm. Hutt, Vice-President of the Board of Trade; Mr. Thomas Field Gibson, one of the Commissioners of the Exhibition of 1851; Mr. H. Cole, C.B., Her Majesty's Commissioner for the Paris Exhibition of 1855; Sir Thomas Phillips, Chairman of the Council of the Society of Arts; Mr. G. Ridley, Chairman of the Newcastle-on-Tyne, Shields, and Gateshead Chamber of Commerce; Mr. D. Hollins, Chairman of the Potteries Chamber of Commerce; Mr. Robert Thompson, President of the Chamber of Commerce, Stockton-on-Tees; Mr. Thomas Evans, Chairman of the Bristol Chamber of Commerce; Mr. Edmund Potter, President of the Manchester Chamber of Commerce; Mr. John Whitwell, Chairman of the Chamber of Commerce, Kendal; Mr. William H. Payne, Vice President of the Dover Chamber of Commerce; Mr. J. R. Stebbing, President of the Southampton Chamber of Commerce; Mr. Henry W. Ripley, President of the Bradford Chamber of Commerce; Mr. C. M. Norwood, President of the Hull Chamber of Commerce; Mr. John J. Kayll, President of the Sunderland Chamber of Commerce; Mr. J. Jobson Smith, President of the Sheffield Chamber of Commerce; attended by Mr. E. A. Bowring, Secretary to the Committee.

THIRTEENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition will be opened on Monday, the 1st April, and will remain open every day until further notice, from 10 a.m. to 4 p.m., members and their friends being admitted free.

Members by ticket, or by written order, having their signature, may admit any number of persons. Members of Institutions in Union with the Society are admitted on showing their cards of membership.

FIFTEENTH ORDINARY MEETING.

WEDNESDAY, MARCH 20, 1861.

The Fifteenth Ordinary Meeting of the One Hundred and Seventh Session was held on Wednesday, the 20th inst., A. W. Williamson, Esq., Professor of Chemistry, University College, London, in the chair.

The following gentlemen were proposed for election as members of the Society :—

Blagden, George	5, Duerdin-villas, Tollington-park, N.
Broadwater, Robert	3, Billiter-square, City, E.C.
Callow, Thomas	8, Park-lane, W.
Coxon, Thos. Cooper	3 Wharf, City Basin, E.C., and 351, City road, E.C.
Dodsworth, Thomas	Clifton, York.
Gilbertson, W.	Laleston House, Bridgend.
Greaves, Richard	The Cliff, Warwick.
Hertz, —	Manchester.
Jackson, Thomas	Railway Station, Milford Haven.
Jones, Daniel Morgan	1, Amen-corner, Paternoster-row, E.C.
Kennaway, William	The Shrubbery, Exeter.
Kisch, Simon Abraham	8, Lancaster-place, E.C.
Lake, James	Newlands, Sittingbourne.
Langton, W. H. Gore, M.P.	Clifton-court, Clifton, Bristol.
Lawn, William S.	Lancashire and Yorkshire Railway, Manchester.
Le Capelain, J.	Wood-lane, Highgate, N.
Miles, Pliny	169, King's-road, Chelsea, S.W.
Ralph, Jno. Rhodes	Savile Lodge, Halifax.
Reiss, James	Manchester.
Rendle, Wm. Edgecumbe	Mount View, near Plymouth.
Tootal, Edward	The Weaste, Eccles, near Manchester.
Uzielli, Theodosius	Hanover Lodge, Regent's-park, N.W.
Villiers, Rt. Hon. C. Pelham, M.P.	39, Sloane-street, S.W.
Wright, Francis Beresford	Osmaston Manor, Derby, and 21, Dover-street, W.
Wright, F., Junr.	,, ,, ,,

The following candidates were balloted for and duly elected members of the Society :—

Adam, James S.	8, Philpot-lane, E.C.
Allhusen, Christian	Newcastle-on-Tyne.
Arthur, James Kennedy	18, Somerset-street, Portman-square, W.
Brooke, William	Brook-street, Manchester.
Burke, John S.	4, Queen-square, Westminster, S.W.
Chambers, George	11, George-yard, Lombard-street, E.C.
Dumergue, Captain Edward	Cleveland-walk, Bath.
Etches, Wm. Jeffery	The Park, Litchurch, and Derby.
Forster, H. Rumsey	Messrs, Samuel Allsopp & Sons, 61, King William-st., E.C.
Gibbs, Henry Hucks	St. Dunstan's, Regent's-park, N.W.
Guedalla, H.	Gresham Club, City, E.C.
Hutchins, E. J.	6, Kensington Palace-gardens, W.
Ibbotson, Thomas H.	12, New Brown-st., Manchester.
Letts, Thomas, jun.	Sydenham, S.E.
Oakley, Henry	Great Northern Railway, King's-cross, N.
Rose, William Anderson, Alderman	Queenhithe, E.C.
Stevenson, John	Canal Foundry, Preston.

The Paper read was—

THE ECONOMIC HISTORY OF PARAFFINE.

BY CHARLES TOMLINSON, LECTURER ON SCIENCE, KING'S COLLEGE SCHOOL, LONDON.

It must often I think have occurred to the members of this Society, accustomed as they are to the contemplation of natural as well as artificial products, how wide a difference exists between the two; how apparently exhaustless the one, how limited the other; how rich in suggestion, how profitable for study the one; how comparatively barren, how easily comprehended the other. Take, for example, almost any natural object, point out its properties, say all that is known respecting it, and it will probably not be too much to assert that quite as much remains to be discovered as is already known. Take almost any product of the industrial arts, any machine or contrivance formed by art or man's device, and you will

be able soon to exhaust its properties, soon to tell everything relating to it—it was made for certain purposes—it fulfils those purposes more or less completely; and when most admirable, it is probably because it has conformed to scientific teaching, and has taken inspiration from some natural law.

There is scarcely a better known natural product than common coal, and yet how marvellous are the properties of that familiar substance. Its history, if fairly written, would be of the bulkiest; it would take us into many sciences, it would draw upon many arts, and when written—when all that is known respecting it had been set down—the last words of the last page must still be, "To be continued."

Such must ever be the case when the finite attempts to take measure of the Infinite—when the human seeks to scan the purposes of the Divine mind in the varied relations of an individual specimen of any one of the great kingdoms of nature.

I trust the Society will not deem these reflections impertinent to my subject, which, though including only one of the applications of coal, is indeed so large, that in attempting to give anything like a complete and logical account of it, I am bewildered with its richness, and the multiplicity of details, all so important, and so suggestive, that my task of selection would be one of great difficulty, were I not guided by a principle which this Society I know will appreciate, namely, that of insisting on its technological, rather than on its scientific bearings. The botanist, the chemist, the geologist, the palæontologist, have abundant information to give us respecting the various kinds of coal, bitumen, petroleum, &c. My business is to gather together a few details chiefly respecting one substance that has been associated with coal and other carbonaceous bodies, and to point out some of its applications to the arts of life.

Paraffine, however, is so mixed up with other compounds of carbon and hydrogen that it will not be easy to disentangle it without some reference to them. I must, however, be permitted once more to remind the Society that my object is industrial, not chemical. Some of the most illustrious chemists of this and of other countries have been, and are devoting their high powers to the solution of questions of great importance and still unsettled, respecting the products of the different varieties of coals and bitumens, so that it would be presumptuous in me, a simple technologist, to pretend to do more than invite the attention of the Society to a few practical applications of the labours of those distinguished men.

In common with all other branches of industry the distillation of coal has been of slow growth. Sources of inflammable gas had long been known to exist in the coal districts of this country before the year 1659, when Mr. Shirley communicated to the Royal Society of London a notice of some experiments on an inflammable gas issuing from a well near Wigan, in Lancashire. Some years later Dr. Clayton made some direct experiments on the distillates of coal, but they were not communicated to the Royal Society, or indeed made public, until the year 1739. He says:—"First there came over a flegm, then a black oil, and then likewise a spirit arose, which I could in no wise condense." This spirit (as the inflammable non-condensible gas was called) excited so much curiosity that the black oil was disregarded. Yet Dr. Hales, in 1726, had published a notice of some experiments on the distillation of coal, and had mentioned the condensation of a volatile oil in the vessel attached to his still. Dr. Watson also noticed the production of oils, when coal is heated to redness in close vessels.

This scanty information expressed all that was known for many years on the subject of the liquid products of the distillation of coal.

In 1781 Lord Dundonald obtained a patent for "a method of extracting or making tar, pitch, essential oils, volatile alkali, mineral acids, salts, and cinders from pit-coal"—"which coals, being kindled, are enabled by their own heat, and without the assistance of any other fire, to throw off in distillation or vapour, the tar, oil, &c., they contain into receivers or condensing vessels,"—"the art depending on the management of the air admitted into the kilns, which can only be acquired by experience."

In 1797, a writer in the *Encyclopædia Britannica* refers to Lord Dundonald's process with applause, "He turns to a very considerable profit the mines of coals in his and other estates, building ovens of a proper construction for burning pit coal into coke, and at the same time collecting in separate receptacles the volatile alkali, oil, tar, and pitch, which are generally lost by the usual method." The writer goes on to say, that this method, compared with the usual method of coking coal, "affords a very remarkable instance of the great losses to mankind, for want of carefully attending to every result from great processes of art when made on a large scale. These ovens are so contrived as to admit an under supply of air, and the coals, after being kindled, decompose themselves by a slow but incomplete combustion, which does not destroy the ingredients. The residuum left in the oven proves to be most excellent cinders or coaks."

It appears that about this time M. Faujas de St. Fond introduced into France a similar process, from information which he had obtained at Lord Dundonald's works, forgetting, however, as Frenchmen sometimes do, to acknowledge the source of his information.

The article above referred to states that, "on subjecting pit-coal of any kind to distillation in close vessels, it first yields phlegm or watery liquor, then an ethereal or volatile oil, afterwards a volatile alkali, and lastly a thick and greasy oil; but it is remarkable, that by rectifying this last oil, a transparent, thin, and light oil of a straw-colour is produced, which being exposed to the air, becomes black like animal oils."

Mr. Northern, of Leeds, in the *Monthly Magazine* for April, 1805, directed attention to the use of coal gas. He says, "I distilled in a retort 50 oz. of picked coal in a red heat, which gave 6 oz. of a liquid matter covered with oil, more or less fluid, as the heat was increased or diminished; about 26 oz. of cinder remained in the retort; the rest came over in the form of air. * * In the receiver I found a fluid of an acid taste, with a great quantity of oil, and at the bottom a substance resembling tar." In this, and in Lord Dundonald's previous process, we have the germ or basis of the manufacture of volatile oils from coal. The germ, however, was destined to remain nearly half a century without expanding, and what at last gave it vitality was the demand for rapid solvents of caoutchouc, which led to the distillation of tar, as a source of benzole, when other valuable luminiferous agents were found to be present, or separable from the tar.

The subject, however, had not altogether remained neglected. Substances were obtained from different sources, and by different inquirers, in various parts of the world, and at length becoming assembled and made known to each other, certain relationships were recognised where least expected. In 1812, Mr. Le Witte patented an apparatus for extracting tar from coal, for the manufacture of varnishes, and for protecting surfaces. It is stated that 10 per cent. of tar was thus obtained, while the residual coke was a valuable marketable product. In 1819, Theodore de Saussure obtained from the asphaltic limestone, near Neufchatel, in Switzerland, an oil which he found to be identical with that from the petroleum of Amiano. In 1824, Chervau took out a patent for a method of distilling bitumen from the rocks in the Department of Sâone et Loire. The manufacturers stated that they extracted 40 parts of volatile oils from 100 parts of rock, and they recommended their bitumen or naphtha as a fuel for alcohol lamps. The year 1829 introduces us to Reichenbach, the proprietor of chemical works in Moravia, whose name occupies a high place in connection with our subject. In that year, while examining the tar obtained from the dry distillation of beech-wood, he discovered *paraffine*, a wax-like substance, which earned its name from its want of

affinity for other bodies (*parum affinis*, or "little affinity") for it would neither unite with acids nor alkalies; it was insoluble in water and alcohol, and had no action on metals. An oil, which possesses some of these properties, has received the name of paraffine oil, and has been extensively used as a lubricator. Reichenbach, also, in pursuing this inquiry recognised paraffine in the tarry matters distilled from other species of wood, and also in the tars arising from the distillations of the bitumens, and, at a later period, in the tar obtained from coal. He also obtained from the tar of wood naphthalin and kreosote, and also bodies named piccamar and pittacal, which have been but imperfectly examined. In 1833 and 1834, he distilled coal in close vessels in contact with water, but from 220 lbs. of coal he obtained only 9 ounces of volatile oil. In 1833, Dr. Bley obtained a small quantity of volatile oil, and some ammoniacal products, by distilling brown coal. These failures, as they must be called, so far as respects coal, arose from misapprehension respecting the required temperature, the manipulation of the gas house naturally suggesting a high degree of heat, and inquirers did not recur to the earlier methods of trying the effects of a comparatively low one. As early, however, as 1841, improved forms of apparatus for distilling coal were introduced by the Count de Hompesch and others, and the problem how to obtain liquid products instead of permanent gases began to assume a clearer form.

Hompesch's patent is "for improvements in obtaining oils and other products from bituminous matters, and in purifying and rectifying oils obtained from such matters." These are "bituminous schists, shales, or slates, or other rocks or minerals containing bitumen or bituminous substances." He describes the oil of schist or clay slate as "essential oil, intermediary fat oil, and thick oil." His method of distillation is in a long iron close retort, arched on the top, and flat at the bottom, and part of his apparatus is an Archimedean screw, for filling the retort and turning out the coke at the other end.

There were three tubes leading from the retort, one at the part farthest from the furnace, another in the middle, and another at the end nearest the furnace, and Hompesch says that he obtains the three separate oils by the gradual increase of the heat, thus effecting distillation without decomposition of the substance. His mode of rectifying the fat oil is by distilling it with sulphuric acid and treating it with caustic potash lees.

In 1845, M. Du Buisson patented a process for "new and improved methods for the distillation of bituminous schistus, and other bituminous substances, as well as for the purification, rectification, and preparation necessary for the employment of the productions obtained by such distillation for various useful purposes." His works were at Autun, in France, and one feature in his process is the employment of steam. He applies a low red-heat, and "when the oil begins to be disengaged, steam is introduced through the cock into the cast-iron pipes which are now heated to redness." His object in introducing the steam is to abridge the process of distillation. "The effect," he says, "of introducing steam at a high temperature, is to shorten the time necessary for distillation, six hours for every sixteen, which is a very great advantage, and nearly double the quantity of oil is produced in a given time." By the introduction of steam also, "the retort does not require to be heated to so high a temperature, which prevents decomposition of the oils, and saves wear and tear of the apparatus." The practical effect of the steam was thus to carry off the vapours of the schist as fast as they were formed, and to prevent the retort from being raised above a red-heat by the external application of the fire. The products of the distillation were a liquid bitumen, named raw oil of schistus, ammoniacal water, and a carbonaceous residuum. From this raw oil of schistus are obtained two volatile oils, the first of which may be used in lamps with the greatest advantage with a reservoir below, and with a double current of air in which the oil rises a distance of about five inches by the capillary attraction of the wick. The light is described as being "superior to that of gas, without any unpleasant smell or smoke; the said lamps have a glass or chimney, with a diaphragm of the same diameter as the wick, and placed a little above the top of the burner." Another oil is also described, capable of being "burnt in the said lamps without any alteration, by mixing with it a corresponding oil obtained from petroleum and other bituminous mineral substances." In the third place he gets a fatty mineral oil, which he says "contains paraffine in large quantity. It is particularly applicable for lubricating, for machinery;" and fourthly, he obtains paraffine "by crystallisation from fat and thick oils; it is thus obtained very pure, and requires but little treatment to make excellent candles." He also gets a black and siccative tar. His method of purifying the raw oil is by distillation with sulphuric acid, drawing off the supernatant oil, neutralising the sulphuric acid by means of a caustic solution of soda, and by alcohol, the latter carrying off a pure red colouring matter. He also distils again, and collects the different oils of different densities into separate receivers. He has also a method of depriving the first refined product of its bad odour by means of sulphuric acid, caustic soda, hydrate of protoxide of iron, sulphate of iron, and caustic solution of soda, and he cautions against putting water upon the oil before the caustic solution of soda, since the effect would be to clog the wick and to make the paraffine oil give out a bad smell while burning. With respect to the paraffine, he states that "it may be separated from the oil merely by pressure in the same manner that stearine is separated from oleine." The paraffine is then melted and filtered on a small quantity of animal black in a double funnel, heated by steam or boiling water, after which it is fit for making candles.

In France, M. Selligue had obtained tars by distilling the bituminous schists of Autun, and the paper coal and bituminous slate of the coal formation. He also purified the oils, and produced burning fluids, which had a considerable sale in France. In 1847, Mansfield obtained a patent for the separation and purification of volatile liquids from tar, and his benzole (which he was the first to obtain, nearly pure, on a large scale) met with a ready sale as a solvent of caoutchouc. Mr. Lowe had, a few years before, applied the lighter portions of coal naphtha to increase the luminosity of coal gases; and naphthalized gas was for a time a familiar term.

In 1849-50, works were erected at Weymouth, in Dorsetshire, for carrying out Du Buisson's process. Works were also carried on near Wareham, in the same county, by the Bituminous Shale Company, and they advertised the sale of oils from shale as "Oil No. 1, or volatile; oil No. 2, or rough oil, which contains paraffine, grease, and varnish; oil, No. 3, or machine oil, which contains paraffine, grease, and varnish, grease liquid, alkaline ditto manufactured, asphalte or varnish." It appears, also, that Mr. John Thomas Cooper, the Consulting Chemist, in 1847, prepared paraffine oil, lubricating oil from paraffine, and paraffine itself, from the distillation of coal. In 1849, the Bog-head Cannel became known, and was used as a source of paraffine and paraffine oils. Mr. James Young's patent bears date 1850, and its origin may be referred to about the year 1847, when Dr. Lyon Playfair called Mr. Young's attention to a petroleum spring in Derbyshire, which he thought might produce some oils useful to the manufacturer. On examining this spring, it was found to be in an old coal mine. The coal had been worked out, and from the roof, which consisted of sandstone, there exuded a thick, dirty-looking oil, known as petroleum or rock oil. Mr. Young obtained from it some useful lubricating oils, and as the supply was but limited, he invented a process for obtaining rock oil from coal, the varieties best suited to his purpose being parrot-coal, cannel-coal, gas-coal, and, lastly, bog-head mineral. Mr. Young is entitled to the merit of having invented a number of useful processes for the separation and purification of these oils, without apparently being aware of what had already been accom-

plished in the same branch of industry. Mr. Young, with his partner, Mr. Meldrum, erected works on the Boghead estate, 15 miles from the Forth, for the advantage of being within reach of the Boghead cannel, or, as it is now called, the Torbanehill mineral. Their process is as follows:—The retort is placed vertically, with a hopper on the top; the fire is applied by a kiln below; the retort is cased with fire brick for about three-fourths of its height, so that the heat passes through this to the retort. As the coals come down, they are distilled by the heat, and the products are passed through a worm pipe into a refrigerator, where they are condensed. The first product is described as a crude oil, containing paraffine. It is distinguished from tar in not drying by exposure to the air, and in being lighter than water. The rectification is by the application of sulphuric acid and soda, with two or three distillations. About two-thirds of the oil is run off as oil, part for burning and part for lubricating. The solid remainder contains paraffine, from which it may be extracted by the ordinary methods of purification.

In the great Exhibition of 1851, Mr. Young obtained credit, and justly, for the production of paraffine in considerable quantities. The former processes, although containing all that was necessary for its production, were not commercially successful. Either they do not produce the article in sufficient quantity, or at a sufficiently low cost to be profitable. Mr. Young has the great merit of first drawing public attention to the commercial value of paraffine, and of pointing out the sources from which it could be profitably extracted.

In Germany, paraffine works were started in 1855, at Beuel (near Bonn), Ludwigshafen, and Töplitz, and paraffine was soon applied to many uses, and met with a large demand. Manufactures were also established in France and Austria, and most extensively in several parts of the United States of America.

In the last-named country the first attempts were made on the bituminous shales of Dorchester, New Brunswick. Extensive works were erected at Brooklyn, near New York, Pittsburgh, Baltimore, and at several places along the Ohio valley and river. The oils produced are in great demand, exceeding till lately the supply, as solvents, lubricators, and for illumination. They give a whiter and more brilliant light than any fixed or fat oil, and are much cheaper. Hence they limit the demand, and keep down the price of fish, lard, and sperm oils; but complaints have been made that the oil is sent out in a crude and impure state, retaining much of the tar and creosote impurities.

The term photogen has been applied to the oils or naphthas obtained from shales, brown coals, cannels, and especially the bog-head variety, and used for illuminating purposes. It is also known as paraffine oil. It differs in specific gravity from ordinary coal oils of the same boiling point, varying from ·820 to ·830, while common coal naphtha has a density of ·850. When photogen has a higher density than that indicated, and a very high boiling point, it probably contains paraffine. The photogen may also be obtained from ordinary bituminous coals by distilling them at a temperature of about 700° C. Coal is broken small, heated in iron retorts, and the tar is received through a very wide worm into tanks. In some cases the coals are distilled by the heat of their own combustion, or by a modification of Lord Dundonald's plan. The tar thus obtained is distilled, and the lighter portions, after purification, form what is called boghead naphtha, or as, in Germany and elsewhere. the distillate is divided into two portions, the more volatile being photogen, and the less volatile solar oil. Both oils are purified by concentrated sulphuric acid, which removes the highly coloured and odorous constituents of the distillate, and also by an alkali, which removes carbolic acid and its congeners, together with the remains of the sulphuric acid and some sulphurous acid. In this country, the heavy and light oils are mixed together, so as to produce a fluid of medium density and volatility. The more volatile hydro-carbons give great inflammability and fluidity, and they are also more odorous than the less volatile portion of the distillate, which is the true paraffine oil.

At the establishment near Bonn, the lignite of the neighbourhood, known as leaf or paper-coal, is distilled at a low red read heat in iron retorts. A blackish tar and ammoniacal liquid are the product; the former is said to yield 90 per cent. of oils, 50 per cent. of which are thin enough to burn in lamps. They are purified by means of sulphuric acid and alkaline leys.

Wagenmann's process is with bituminous coal, which is broken into small lumps, sprinkled with milk of lime, to get rid of sulphur, dried in a desiccating furnace, and distilled in retorts. The liquid products are received into a large reservoir, kept at a constant temperature of 30 deg. centigrade, where the tar separates from the ammoniacal liquor, and the latter being mixed with the residue of the large retorts, furnishes a good manure. The tar is pumped up into the purifying apparatus, mixed with sulphate of iron, and distilled in vessels of the capacity of 350 gallons, by means of superheated steam. The products are condensed in a leaden coil, and consist of volatile liquids of the specific gravity of ·700 to ·865, heavy oils for lubrication, ·865 to 900 and paraffine, ·900 to ·930. These three substances are treated each with 4, 6, and 8 per cent. of sulphuric acid, 1¼th and 2 per cent. of hydrochloric acid, and 1 per cent. of acid chromate of potash, with which they are agitated for half an hour. They are then left for three hours, poured off the dregs, and mixed with 2, 3, and 4 per cent. of a ley of caustic potash (50° B). Lastly, each of the products thus purified is placed in a still, and distilled by superheated steam. No. 1 mixed with No. 2, so as to obtain the specific gravity of ·820, produces the mineral oil or photogen, which is burnt in lamps fitted for the purpose. Part of the product distilled from No. 2 having a specific gravity ·860 to ·700, forms the solar oil, which may be burnt in Argand or Carcel lamps; the rest of No. 2, mixed with some of the product of No. 3, furnishes the lubricating oil for machines. The remainder of No. 3 is introduced into a vat, where the temperature is lowered till it crystallises. In the course of three or four weeks, the paraffine crystallises in large tablets, and is separated from the adhering oil by means of centrifugal machines, making 2,000 revolutions per minute. The paraffine is melted and rolled into squares, and subjected to a strong hydrostatic pressure. It is then again melted, and treated with 50 per cent. of strong sulphuric acid, at a temperature of 180 deg. C. In two hours the paraffine separates from the acid, and is washed with water; it is then run into cakes, and pressed in the hydrostatic press while hot between two layers of hair cloth. It is once more melted, mixed with 5 per cent. of stearine, and maintained for some hours at a temperature of 150 deg. C. in a leaden apparatus. It is lastly mixed with one per cent. of a solution of caustic potash (40 deg. B.), and at the end of two hours all the impurities will be separated, and the paraffine may be drawn off as limpid as water.

In a valuable article on photogen, by Mr. Greville Williams, in the last edition of "Ure's Dictionary," is a table showing the materials employed for distilling these oils with the per centage of tar of the oils and of paraffine. The raw material consists of Trinidad pitch, the bog-head cannel, or torbane mineral of Scotland, Dorset shale, Belmar turf from Ireland, George's bitumen from Neuwied, paper coal and brown coal from various parts of Germany, and Rangoon tar. But of all the substances hitherto employed none are so rich in results as the last.

This brings us to speak of some of nature's distillations. Various bitumeniferous productions are formed in vegetable matter during its conversion into coal. Among these are mineral oil, an inflammable fluid, sometimes forming powerful springs, and frequently occurring in carboniferous deposits. Likewise naphtha, a transparent and nearly colourless liquid, burning with a copious flame, and strong odour, and leaving no residuum. Springs of naphtha may

burst forth during mining operations, as in the coal-shale of Derbyshire, where, in driving a level, a large quantity of this liquid poured forth and covered the surface of the water in the level, and being accidentally set on fire, it formed a burning spring, which lasted several weeks. There is also petroleum, a dark coloured substance, thicker than common tar, which rises in immense quantities from some of our own coal beds, and from the carboniferous strata of some parts of Asia and elsewhere. Petroleum springs do not seem to depend on combustion, as has been supposed, but to be simply the effect of subterranean heat. And it is not necessary that the depth should be very great beneath the surface to give a temperature equal to the boiling point of water, or of mineral oil. In such a position the oil may be supposed to suffer a slow distillation, and so find its way to the surface, or it so impregnates the earth as to form springs and wells, as in Persia and India. Petroleum springs are those whose waters contain a mixture of petroleum and the various minerals allied to it, such as bitumen, naphtha, asphaltum, and pitch. They are very numerous, and in many cases undoubtedly connected with subterranean fires which raise or sublime the more subtle parts of the bituminous matters contained in rocks. Petroleum springs occur in abundance in Modena and Parma, in Italy, but the most powerful of which we have any account are those on the Irrawadi, in the Burman empire. In one locality there are said to be 520 wells, which yield 400,000 hogsheads of petroleum annually. The heat by which these chemical changes and transformations produce from vegetable matter such enormous quantities of petroleum, may also cause this substance to be forced up to the surface, in its native state, where by exposure to the air it becomes inspissated, and forms the different varieties of pure and earthy pitch or asphaltum, as in the case of the vast accumulations in the island of Trinidad. Bitumen is an inspissated mineral oil, of a dark brown colour, with a strong odour of tar. It sometimes occurs of the consistence of jelly, bearing some resemblance to soft India rubber, and as it will remove the traces of a pencil, it has been named "mineral caoutchouc." Native bitumen and the substance of that name obtained from certain varieties of coal, when heated, if not identical, are closely allied, or yield products which are so. The varying proportions of bitumen which different varieties of coal are capable of yielding depend on the amount of change which the vegetation has undergone since its deposition. In some cases the internal heat, accompanied by moisture and great pressure, has expelled all the volatile matter, and reduced the coal to the state of anthracite. The amount of volatile matter in coal and bituminous minerals may vary from 10 to 63 per cent., forming the different varieties of dry and fat coal. The bitumen of coal resembles the bitumen of nature known as asphalte and mineral tar in its sensible qualities and general appearance; but it does not contain the same proximate principles; nor does it by dry distillation yield the same fluids. "They belong, however, to the same natural group or series, and tend to strengthen the opinion generally held that bitumen, petroleum, and asphalte, arise from the decomposition of fossil vegetation. The natural bitumens always contain some volatile oil ready formed, and their varieties depend on the greater or less proportion of this volatile oil present in them."

It was long supposed that the paraffine of tar, and of certain mineral substances used for the production of heat and light, was not a natural product, but one entirely due to the artificial action of heat upon those substances; but as Professor Bolley has pointed out (Mem. Chem. Soc.), masses of naturally separated paraffine have been found in deposits of rock oil, at Borystow, in Galicia, while the minerals ozokerite, sheererite, idrialin, &c., show that hydro-carbons differing considerably in melting point, and chemical composition, occur ready formed in nature. Professor Bolley has also detected paraffine ready formed in bog-head shale, by exhausting it with various re-agents. A kilogramme of the pulverised shale yielded to alcohol 2·14 parts of solid extract residuum and to ether, after drying, 2·63 parts. Ths latter was unctuous to the touch, and not very deeply coloured; it could be redissolved in ether, and decolorised by agitation with animal charcoal. The residue then exhibited by elementary analysis, a quantity of oxygen amounting to 11 per cent., and gradually turned yellowish when heated for some time in a water-bath above its melting point. It sustained a loss by boiling with soda-lye, and the undissolved portion melted at 41° C. It remained colourless when heated, solidified in crystalline laminæ, was insoluble in water, sparingly soluble in alcohol, somewhat more soluble in ether. The analysis of this residue gave—

Carbon	86·33 per cent.
Hydrogen	13·32 ,,
	99·65

Professor Bolley thinks it probable that paraffine exists as such in several of the materials from which it has hitherto been prepared by destructive distillation, and he submits the above process of separation as a convenient method of testing such substances, with reference to their utility for the preparation of paraffine. Remarking on the common statement that the non-existence or rarity of paraffine in coal tar is due to the great heat employed in the distillation, he suggests that it is rather because true coal does not contain paraffine ready formed, and therefore cannot yield a tar containing paraffine. On examining two sorts of coal by this method, he obtained, not paraffine, but an extract of the nature of asphalte. It may be remarked, however, that Professor Bolley's method would have been more complete if he had subjected his specimens to the action of heat, when he would probably have obtained a further development of paraffine.

Petroleum, in many parts of the world, is now the most abundant source of photogen and paraffine. In the State of Pennsylvania, according to a statement in the *Times*, petroleum wells are sunk, and they yield from ten to fifty barrels of oil per day, and some even more. Last year, in Ohio, fifty miles from Cleveland, oil was discovered; fifty wells were at once sunk, and they yielded from ten to sixty barrels a day, and a few months later hundreds of wells were in operation. It is refined for illuminating purposes, and is said to be superior to the best sperm, at half the price, while in the crude state it is a good lubricant, and is in great demand by the railway companies.

But, perhaps, the most remarkable commercial fact is, that the Rangoon tar finds its way from the banks of the Irawadi to this country, and is the source of the beautiful paraffine candles which are burning on the table before you. This Rangoon tar, or Burmese naphtha, is used by the natives as a lamp fuel, and as a preservative of timber against insects. When drawn up it is a semi-fluid naphtha. It occurs among sandstone and blue clay. It is as soft as goose-grease, of a greenish-brown colour, and of a peculiar but not disagreeable odour. The wells are sunk to the depth of sixty feet, and the fluid oozes into them. Rangoon tar is imported in close metallic tanks, to prevent loss by evaporation.

The specimens of Rangoon tar on the table, together with the various products separated from it, have been kindly furnished by the managing director of Price's Patent Candle Company, Mr. George F. Wilson, who is well known to this Society. The process adopted at the Sherwood Works is that of Dr. De la Rue,* and consists of a simple separation without chemical change, whereas the solids and liquids, bearing some resemblance to those from

* The Proceedings of the Royal Society of London, vol. viii. (1857), contain an abstract of a paper entitled "Chemical Examination of Burmese Naphtha, or Rangoon Tar," by Drs. De la Rue and Müller.

the Rangoon tar obtained from peat, coal, &c., have been formed by their decomposition.

In the first place the Rangoon tar is distilled with steam at 212 deg. Fahrenheit. The distillate contains a mixture of a number of volatile hydro-carbons, which it is difficult to separate on account of the diffusible nature of the vapours, however different their boiling points. In practice, a second or third distillation is adopted, and the products are arranged according to their boiling points or densities, which vary from ·627 to ·860, and although they all originally came over with steam at 212 deg. Fahr., their boiling points range from 80 deg. to upwards of 400 deg. Fahrenheit. All these liquids are colourless and solvents of caoutchouc. Those of low specific gravity are known as Sherwoodole and Belmontine. They have considerable detergent power, removing stains from silk without impairing delicate colours. The distillate of higher specific gravity burns with a brilliant white flame, and as it cannot be ignited without a wick, forms a useful lamp fuel. Sometimes these lamp fuels may not be sufficiently fluid at ordinary temperatures to ascend the wick. Messrs. Price and Co. have introduced a modification of the old cocoa-nut oil lamp for overcoming this difficulty. A piece of metal is continued from the metal wick-holder down into the reservoir, and by its conducting power gently raises the temperature of the fuel.

A small per centage of hydro-carbons of the benzole series comes over in the first operation. By treating it with nitric acid, nitro-benzole, and other substances valuable in perfumery, are eliminated.

After the first distillation, about three-fourths of the original material remains. This is fused and purified from extraneous ingredients by means of sulphuric acid. A black precipitate is thrown down, which, after being washed, resembles native asphaltum. The purified fluid is removed to a still, and heat is applied by steam through heated iron tubes. The distillates are arranged according to their distilling points, from 300 deg. to 600 deg. Fahrenheit. Those obtained at 430 deg. Fahrenheit, and upwards, contain paraffine.

It is stated, in the Memoir above referred to, that at 212°, 11 per cent. of fluid hydro-carbons distil over, entirely free from paraffine; that between 230° and 293°, 10 per cent. more fluid distils over, containing only a very small quantity of paraffin; that between 293° and 320° the distillate is very small in quantity; but from that to the fusing point of lead, 20 per cent. more is obtained, and although containing an appreciable amount of paraffine, it remains fluid at 32 deg. At this point of the distillation the products begins to solidify on cooling, and there is obtained 31 per cent. of a substance of a sufficient consistency to be submitted to pressure. On raising the heat considerably, 21 per cent. of fluids and paraffine distil over. In the last stage of the operation 3 per cent. of pitch-like matters are obtained, the residue in the still, consisting of coke containing a little earthy matter, amounts to 4 per cent.

The results of this distillation are given in the following table:—

At 212°, free from paraffine	11.0
230 to 293°, 293 to 320°, } a little paraffine	10·0
320 to fusing point of lead, containing paraffine, but still fluid at 320°	20·0
At about the fusing point of lead, sufficiently solid to be submitted to pressure	31·0
Beyond fusing point of lead, quantity of paraffine diminishes	21·0
Last distilled, pitchy matters	3·0
Residue in still, coke containing a little earthy impurity	4·0
	100·0

The above distillates are all lighter than water. Most of the paraffine may be separated from them by exposing them to a freezing mixture, so that no less than between 10 and 11 per cent. of this valuable solid hydro-carbon may be obtained from the Burmese naphtha.

We remember the surprise and curiosity expressed some years ago in the House of Commons when an Irish member, in moving the House in connection with one of the Irish peat companies, lighted a candle, and called attention to it as one of the products of those peat bogs, which hitherto had inflicted sterility on a large part of Ireland, but were now to become sources of unbounded wealth. Unfortunately, the yield of paraffine from the peat distillates proved to be too small to render the manufacture possible, although Dr. Sullivan states that 3 lbs. of paraffine could be separated from a ton of good dry peat, especially by keeping over the summer oils until the winter. The same remark is to some extent true as regards some other materials, and we know that the bog-head cannel is in most demand as a source of carburetted hydrogen, although paraffine may be extracted from the tar of the gas works. A few years ago an action was brought by the patentees of a paraffine process against a gas company for the manufacture of paraffine in addition to that of gas. The defence was that the paraffine formed itself, and came over with the other secondary products, from which it was separated, not for sale, but for the purpose of lubricating their own machinery.

But in addition to the large proportion of paraffine contained in the Rangoon tar, there is another reason which causes it to be preferred to all other substances, as a source of that material, namely, its higher melting point, which better fits it for the making of candles; for while bog head paraffine melts at from 108° to 114° F.; bituminous coal paraffine at 110°; turf paraffine at 116°; Rangoon tar paraffine has a fusing point as high as 140°. Indeed the varying fusing points of this substance have led to the suspicion that pure paraffine has not in all cases been examined, when data of this kind were being sought for. Professor Anderson, of Glasgow, (British Association Report, 1856), speaks of two distinct kinds of paraffine as existing in bog-head cannel, one highly crystalline after fusion, the other a granular mass resembling bleached wax. The former melted at 114° F., the latter at 126°. A specimen from Rangoon petroleum melted at 142°, while one from peat melted at 116°, nevertheless, all these varieties gave, on analysis, the same results, namely:—

Carbon . .	85·08 per cent.
Hydrogen . .	15·33 ,,

Dr. Sullivan, some years ago, stated that none of the paraffines of commerce are definite bodies, but mixtures of different isomeric compounds. Dr. Antisell* also quotes an analysis by Filipuzzi, of a sample of paraffine made by Young, in Glasgow, from bituminous slate. It was white, crystalline, without odour or taste, of a specific gravity 861°, and a melting point 110°. It partially dissolved in alcohol, and separated by cooling. The mass when separated from the alcohol and placed under the microscope, showed three different forms:—needle crystals, angular grains, and glistening mother of pearl scales. By further treatment he was able to separate nine distinct portions, each of which had a different melting point,

Variety—	1	2	3	4	5	6	7	8	9
Temperature—	113°	118°	120°	121°	123·5°	133·5°	136°	137°	139°
Constitution—									
C.	85·47			85·93			85·72	85·77	85·69
H.	14·29			14·23			14·31	14·21	14·29

Bolley states that most of the commercial paraffines contain stearic acid, that when paraffin is melted it is readily acted on by chlorine, when it gives off bubbles of hydrochloric acid gas, and retains some of the acid tenaciously. In the compound thus formed, some of the hydrogen is

* "The manufactnre of Photogenic or Hydro-carbon Oils from Coals, &c."—New York, 1860.

replaced by chlorine; it is tolerably soluble in benzine, and the solution may be readily spread on paper, wood, &c. The name of chloroffine has been proposed for this substance. Bolley says that he has met with paraffine with as high a melting point as 149·9°, and Laurent has found it as low as 91·4°.

Leaving the question of the composition of paraffine to be settled by competent authorities, there can be no doubt as to the value of this beautiful substance as a candle-making material. The illuminating power is considerable. It is stated that a paraffine candle, weighing one-eighth of a pound, will give as much light as a spermaceti or stearine candle weighing one-sixth of a pound. The low temperature at which it fuses, and the high temperature to which it may be raised without decomposition, namely, upwards of 600° F. point it out as a valuable material for a bath for chemical purposes. The lubricating properties of the fluids obtained in the second distillation have already been referred to. Fixed oils are decomposable into acids which corrode metals; the paraffine oils have no such property, so that they do not corrode the metal bearings of machinery, nor is the brass work of lamps injured by the hydro-carbons burnt in them. As paraffine is not acted on by acids or alkalies, it has been recommended to guard, by means of paraffine, the stopples of bottles holding those substances. A paraffine paper for holding caustic alkali has also been suggested. And, lastly, we may remark, that paraffine realises the desideratum pointed out by Liebig many years ago of a solid olefiant gas, although it is somewhat singular, that in the last edition of his Chemical Letters, that great chemist still appeals to science to produce his favourite solid carburet of hydrogen.

DISCUSSION.

The Chairman said, whilst listening to this interesting communication on the history of paraffine, he could not refrain from thinking that the chemical investigation of the constituents of coal tar had yielded to the industrial arts some of the most valuable substances which of late years had been introduced into general use. It was well-known to the members of the Society, not only that these hitherto almost waste products acquired great commercial value from their production of the wax-like substance paraffine, but also the group of substances of the benzole class, (which, in the first instance, were regarded by chemists merely as scientific curiosities,) for it was from them that the beautiful new and brilliant dyes now so much in vogue were obtained. It was encouraging to those who prosecuted knowledge for its own sake, to find that the results of their investigations had become so valuable commercially. One thing occurred to him upon hearing the paper read, viz., that it might, perhaps, be discouraging to some of the older members of the Society to see those lines of scientific demarcation which were established for the sake of convenience, now so rapidly disappearing through the progress of investigation, particularly that between organic and inorganic chemistry. If anything could be said specially to belong to the dominion of organic chemistry, it was assuredly wax and the substances analogous to it; but here they produced, by a purely chemical process, beautiful substances which *might* be compared with wax, though it would be unjust to do so, for they possessed in a more perfect degree than wax those properties for which wax was valued. They contained no oxygen in their composition, but were pure hydrocarbons. He would not detain the meeting longer by observations of his own, but would now invite discussion upon this interesting paper.

Mr. Boccius inquired whether the boghead coal ought to be considered as a species of shale, the same as paper shale, or as it was termed in Germany the leaf shale of the Rhine, or whether it was a schistus, like that found at Wareham and other parts of Dorsetshire and in Derbyshire; because the shales of Derbyshire were of a different colour to those of Dorsetshire and Portland. In some of the cuttings of railways in Derbyshire, the shale was of a perfectly black colour, and so hard that it was with difficulty blasted. The distinction made by Mr. Young was, that the boghead coal, which was a bituminous mass, was not the same substance as the bituminous shale or leaf shale. It was a curious fact that every description of shale hitherto discovered had its own distinctive properties and qualities. What he wished to know was, whether the boghead coal was considered to be of the same family as the shales?

Mr. G. F. Wilson, F.R.S., said, in this very able *résumé* of all that was known upon this subject, he had to thank Mr. Tomlinson, personally, for several matters with which he was not previously acquainted. In following through the dates in which were traced the different steps by which the practical discovery of paraffine oils was made, there was one which had not been mentioned, which was in May, 1845; and as he (Mr. Wilson) happened to be one of the patentees at that time, he might state that what was described there as distilling schist, in connection with superheated steam, was a process which had been worked by him for three years previously. In 1842 a a patent was taken out for distilling superheated steam, and this process was afterwards applied to the distilling of bituminous bodies. There was another small point he would mention. In describing the lamp which was termed a modification of the old cocoa-nut oil lamp, it should be added that the latter was the invention of one those wonderful people who were good at everything they undertook — Lord Dundonald. The contrivance was, placing a reservoir over the flame, by which the cocoa-nut oil was rendered sufficiently fluid to burn properly. The lamp which had been spoken of that evening scarcely merited to be called an invention, as it merely consisted of a piece of metal so connected with the lamp as to conduct the heat to the hydro-carbon, and render it sufficiently limpid to rise in the wick of the lamp, which it could not otherwise do.

Mr. Thos. Hilton would call attention to the commercial importance of this substance, as shown by a few statistics, which he believed might be implicitly relied upon. At all events, they were not at all in excess. He had been informed that during the last six months, paraffine oil had been made in Scotland from the Torbane-hill mineral, to the extent of 26,000 gallons weekly, which represented a money value of £2.350 per week, and of that quantity two-thirds was oil for burning, and one-third for lubricating. The solid paraffine made in Scotland at the present time represented a value of £450 or £500 weekly. He had taken some pains to ascertain what quantity of this oil was imported from Germany, for during the last six months they had obtained large quantities of oil there from shale, and from all the sources of information he learnt that during the last six months they had received from Germany about 120,000 gallons, of the value of £15,000. It might be supposed the exact returns could be obtained from the Board of Trade, but paraffine was included amongst the number of unenumerated articles. In addition to this there were manufacturers of this oil in England. There was the Asphalte Company at Millwall, and the works at Wareham, though he believed the latter were not now in operation. Perhaps Mr. Wilson could inform them what quantity of that beautiful substance known as Belmontine oil was produced at the works which he superintended. Then there was the Rangoon oil distilled by Sir Charles Price and Co., and he believed they were not able to meet the demand for it. At the present time numerous shops were to be seen all over London, with lamps bearing a label, "This lamp burns eight hours at the cost of a penny," and if that was the real value of the oil, it was most valuable to the working classes and those who studied economy. But one great objection had been felt, that during the last six months they could not get a sufficient supply of the oil to meet the demand, and people had become tired of going to ask for it. As he believed the term "finality" was not admitted by chemists, so they might presume they had not yet arrived at the full

extent of knowledge as to these hydro-carbons. One of the chief burning oils had an unpleasant odour, and the next great step was to try and get rid of that odour; and if that were effected, there was no knowing to what extent the use of these oils would be carried. Considering the very high price which tallow had reached, he knew of nothing in commerce more worthy of the study of the chemist than bringing to greater perfection burning oils of this character. It seemed singular that the Belmontine oil, produced from the Rangoon tar, had very little odour, and that not an unpleasant one, whilst the oil produced from the Torbane mineral had a very unpleasant smell, though the solid product from the same material was nearly inodorous.

Mr. P. L. SIMMONDS said the members of the Society could not but be under obligations to so well-informed a gentleman as Mr. Tomlinson, for the interesting commercial history of a very important product which he had laid before them. It seemed to be wisely ordained that the skill and research of man should be permitted to bring to light at the time when they were most required to promote arts and manufactures, or to enhance his comforts and conveniences, new substances to supply those which had become deficient. Of late years we had in a great measure given up the whale fisheries, our ships finding more steady and profitable employment in the carrying trade of the world. The Americans, too, who had entered more largely upon this adventurous pursuit, were withdrawing many of their vessels from the fishing, and hence the whaling fleet was reduced and the produce diminished. The vast extension of machinery and the demands of social life led to a greater demand for oils for illumination, lubricating, and for the woollen manufacture. Even the vegetable oils, palm, cocoanut, rape, and other seed oils, which were obtained in such large quantities, were found insufficient to supply the wants of commerce, and new sources of oil were sought for from mineral bases. The question of the distillation of coal oils, and the various sources of petroleum and earth or rock oils, had, within the last year or two, attracted a very large share of attention, and several important works had been published in connection with the subject. The native sources of petroleum, naphtha, and asphalte, were already known to be very numerous, and would no doubt, as commerce extended, become even more numerous still. In many parts of Europe, Asia, and America they already formed objects of commercial importance, and he believed their use would be further greatly promoted and the retail price of the oils reduced. The manufacture of mineral oil bade fair to assume a good position among our industrial enterprises, notwithstanding the comparatively small amount of labour that had been spent in the endeavour to perfect the processes. A short time since a bonus of £500 was offered to any scientific or manufacturing chemist who would furnish the advertiser with a cheap and efficient process of deodorizing mineral oil, and now that attention was drawn prominently to this subject, no doubt some beneficial result would ensue. Coal oil had been substituted in New Brunswick, and he believed in some others of the North American colonies, for seal oil in the lighthouses, and the result was a more brilliant light with the consumption of a trifle more than half the quantity of oil required previously. Seeing so many gentlemen well informed on the subject present, he did hope that some further information respecting this highly useful manufacture might be elicited.

Mr. BOCCIUS hoped to have an answer to the question he had put. He might state that he was personally acquainted with Count Hompesch, who took out a patent in this country for the distillation of schistus, and a lease was granted to him by the government of a portion of the northern part of the Island of Portland. He worked the schistus of that district for some time, but all his efforts to get rid of the unpleasant odour were ineffectual. The manufacture occasioned great disgust wherever it was carried on. As regarded the commercial value of these oils no doubt it was of the first importance. On one occasion he gave an engineer a portion of the thinner oil which was used for lubricating the bearings of a wheel which performed 2000 revolutions per minute, and the surprise was that the oil never became hard. With regard to the residue after the thin oil was distilled, they obtained a powerful naphtha from it, which was the best known detergent for cleaning cloth, and from the refuse a charcoal was obtained which was valuable as a manure. If they could get rid of the odour they would have at once a fine burning oil, which he believed would supersede gas and every other kind of illumination, because no other oil gave so pure and brilliant a light as paraffine.

Mr. TOMLINSON said that the boghead cannel was a purer kind of hydro-carbon than many of the Dorsetshire shales, which were all more or less impregnated with fossil remains, and these he thought were most probably the cause of the offensive odour of the oils and other distillates from that class of shale. He was not aware that any fossil remains had been discovered in the boghead cannel.

Professor TENNANT said that many shales afforded these substances, and there were some descriptions of shales which had not yet been tested. He could particularly mention a remarkable kind which had been discovered in New Zealand, and which, he believed, had never yet been tried. A specimen of it had been given him by Lord Alfred Churchill, but up to the present time he had not had an opportunity of doing anything with it; he would, however, be happy to place it in the hands of any chemist who would be willing to test its properties. It was a substance very much like asphalte, and gave forth a pleasant odour, and the discovery of it was made in this way: Some persons were cooking some food, and to their astonishment, after the wood was burnt out, the rock continued to burn for several hours. To his mind, it appeared that this material was likely to yield a large quantity of oil. With regard to the bog-head material, it was a disputed point with geologists whether it was a coal or not. The geologist must define what was coal. Not every black material so called was coal. If they asked whether this boghead material belonged to the geological formation derived from wood, he should say certainly not. There were some materials of this class from Italy—the pure coal class—which emitted a most disagreeable odour. He had no doubt the boghead cannel was produced by volcanic action from rocks beneath, distilling over into the superincumbent material certain substances from the more ancient fossiliferous rocks. They had a bitumen from Cuba and Trinidad, which was brought up to the surface of the ground, whereas boghead was never brought naturally to the surface, which was very likely owing to the superimposed rocks and thick seams of clay overlaying it.

Professor MILLER believed the offensive odour of the products derived from the shales of Dorsetshire to be greatly owing to the presence of sulphurous compounds. The shale contained pyrites, which, when distilled, yielded a great deal of sulphur; and those sulphurous bodies, when formed, were the most troublesome to get rid of. As they had heard that these products could be obtained from Rangoon tar quite inodorous, he hoped, as they proceeded with the investigation, they should eventually get rid of those offensive odours in the products from the shale of this country.

Mr. S. W. BROOKS would be glad to be informed whether this oil, which was likely to become extremely popular, could be burned in the now almost discarded camphine lamps. The argand lamp, which was at one time very popular, was superseded by the camphine lamp, which in its turn was superseded by the moderator lamp; and it was now to be apprehended that the latter would be discarded in favour of the new lamp which had been designed for burning the paraffine oil. He should be glad to know whether, by the introduction of this oil, all the previous forms of lamps would be superseded.

Mr. TOMLINSON thought Mr. Wilson was best able to answer that question.

Mr. WILSON was afraid the camphine and other lamps would not answer for this oil.

Mr. BOCCIUS remarked that these oils required a larger amount of oxygen for their combustion than most other oils, and, therefore, with the old form of lamp they could only get a comparatively small flame. The moderator lamp would not answer, on the score that this oil was rather ethereal, and the wick could be burnt dry without carbonising it. The new American lamp received a charge of air from the centre of the wick, like the old Argand, and when thus aerated gave a most splendid light.

Mr. BROOKS remarked that it simply came to the question whether all the previous lamps would be superseded by this new oil.

Mr. TOMLINSON said whilst the tradesmen of France were advertising these burning fluids, they advertised at the same time lamps especially constructed for the purpose; so that he was afraid there was not much hope for the employment of their old lamps.

Professor MILLER said it was stated upon a recent trial that one house in Glasgow had made nearly a quarter of a million of lamps adapted for burning this particular oil.

Mr. P. H. HOLLAND, referring to the specimens exhibited upon the table, said, with some of those hydro-carbons he was well acquainted, but there were others upon which he should be glad to receive a little explanation.

Mr. TOMLINSON said the specimens of the larger quantity were from the manufactory which Mr. Wilson managed, and perhaps that gentleman would give the explanation which had been asked for.

Mr. WILSON said the Rangoon petroleum was the only source of hydro-carbon with which he had had any large experience. They had all been mentioned in the paper. They started with a substance about the consistency of honey, which oozed out of the ground, and was procured in the state they now saw it, and was so received at the works. The first course of distillation brought off a fluid having very much the properties of benzole, but without its chemical character—a very light fluid indeed. Some of the first part that distilled off was so exceedingly volatile, that some small quantities which he gave to distinguished chemists volatilised from the heat of the hand acting on the bottle. The next product after this fluid, which was used for taking out grease stains, was the material which Mr. Brooks was apprehensive would "extinguish" the lamps he at present used. It was a body of the same class, as a burning fluid, as that used for the lamps which Dr. Miller had spoken of as being made in such large numbers in Glasgow; a very fluid oil, which had the advantage of having been distilled in the processes of nature, which were so superior to anything that man had arrived at. It was distilled apparently at an immense pressure under the earth, with the pressure of water. It might be said to be the natural distillation of the material with super-heated steam, and it had not the unpleasant smell which existed more or less in all those bodies artificially distilled. As in all distillation from schist or coal, immense heat was required before the oil was set free from the material which contained it. After this was distilled, they came to a material which was still a light body, and was known as Belmontine or Paraffine oil, which was the oil to be burned in the new form of lamp alluded to, the only difference between those lamps and the Belmontine lamps being, that there was a little piece of heat-conducting metal, to render the oil for the time being as limpid as the other burning oils in use. The next process was the production of a heavier kind of oil, which, mixed with other oils, was used as a lubricant in the place of sperm oil. After that came the oil which yielded the solid matter from which the candles now exhibited were made.

Mr. HILTON remarked that the camphine lamp was superseded in a great measure owing to the great rise in the price of the camphine after it was introduced, and, being made from turpentine, the supply was not adequate to the demand, and the price rose from 3s. to 6s. per gallon, which rendered it no longer an article of economical consumption for lighting purposes. He should be very glad to see Mr. Young remunerated by the government in the way he deserved, so that the manufacture of this oil might be thrown open, when he believed it would be produced in such abundance as that it could be sold for 2s. per gallon.

Mr. TOMLINSON remarked that Mr. Young's patent would expire in about two years.

Mr. HILTON inquired whether there was a probability of obtaining any large supply of this oil from America?

Mr. TOMLINSON replied, as far as his information extended, they were at present unable to meet the home demand.

The CHAIRMAN, in proposing a vote of thanks to Mr. Tomlinson for his paper, beggged to make one remark in connection with the singular wish expressed by Liebig many years ago, which was one he (the Chairman) could never quite understand. It was, that they might have a gas either in a liquid or solid form. The difference between gas as they now used it and other combustible bodies of similar composition,—in fact the true value of gas, rested upon the circumstance that it was gaseous. Physical research had shown that olefiant gas was of the same chemical composition as certain kinds of paraffine, and he believed there was no ground for doubting that the circumstance of more heat being evolved by the combustion of an ounce of olefiant gas than by that of an equal quantity of paraffine in a solid form, was the cause of the greater amount of light emitted by the former during the process of combustion. The practical reason for introducing this remark was to mention that his friend Dr. Frankland had made a very beautiful lamp, which seemed adapted for giving to paraffine oil what it wanted, viz., the making it a gas. The lamp consisted of a small argand burner, with two concentric glass chimneys, one narrow and tall, and the other wide and short, and so arranged that the air which supplied the flame passed between the two chimneys in the annular space, becoming heated in going down. In fact, it was a hot-blast burner. He was not sure whether this lamp had been published, but Dr. Frankland had mentioned to him that ordinary gas, burnt under these conditions, would give forty per cent. more light than when burnt in the ordinary manner with an argand chimney. It seemed to him to be a direction in which it was worth while to try and improve those lamps which were now being made for the combustion of these valuable oils. He now begged to propose—what he was sure the meeting would cordially agree to—a vote of thanks to Mr. Tomlinson for his valuable communication.

A vote of thanks was then passed.

The paper was illustrated by specimens of paraffine and similar preparations, as well as the materials from which they are obtained, and the candles manufactured from them. These were contributed by Mr. G. F. Wilson, F.R.S., of Price's Patent Candle Company, and by Messrs. Hilton and Rider, to whom the thanks of the Society are due.

The Secretary announced that there would be no meeting on Wednesday next, it being Passion week, and that on Wednesday the 3rd of April, a paper "On Economic Contrivances and Labour-Saving Machines used in the United States of America," by Dr. C. W. Eddy, M.A., M.B., formerly Travelling Fellow of the University of Oxford, would be read.

INTERNATIONAL EXHIBITION OF 1862.

The following is a list of articles on which customs duties are now levied, showing the duties payable in each case. Those articles which are marked with an asterisk will be relieved from duty before the Exhibition of 1862.

Marked thus (†) 5 per cent. additional duty to be charged.

Articles	Duty. £	s.	d.
*Almonds, Paste of (until 1st July, 1861) lb.	0	0	2
Arrowroot ... ... cwt.	0	0	4½
Barley, Pearled ... ... ,,	0	0	4½
Beer or Ale ... Barrel of 32 Gallons	1	0	0
,, Mum ... ,, ,,	1	0	0
,, Spruce ... ,, ,,	1	0	0
,, of other sorts ,, ,,	1	0	0
Biscuit and Bread ... ... cwt.	0	0	4½
Books, being of editions printed in or since the year 1801, bound or unbound, cwt.	0	16	0
,, admitted under treaties of international copyright, and of and from a British Possession ... ... cwt.	0	15	0
Cards, viz., Playing Cards ... Dozen Packs	0	15	0
Cassava Powder ... ... cwt.	0	0	4½
*Cherries, dried, till 1st July, 1861 ... lb.	0	0	2
Chicory, raw or kiln dried ... ... cwt.	0	6	0
,, roasted or ground ... ... lb.	0	0	4
Chloroform ... ... lb.	0	3	0
Cocoa ... ... lb.	0	0	1
,, Husks and Shells ... ... cwt.	0	2	0
,, Paste or Chocolate ... ... lb.	0	0	2
Coffee ... ... lb.	0	0	3
,, kiln-dried, roasted or ground ... lb.	0	0	4
*Comfits, dry, till 1st July, 1861 ... lb.	0	0	2
*Confectionery ,, ,, ... lb.	0	0	2
*Corks, ready made, till 31st March, 1862, lb.	0	0	3
Corn, Grain, Meal and Flour, viz.—Wheat Barley, Oats, Rye, Peas, Beans, Maize or Indian Corn, Buck Wheat, Bear or Bigg ... ... quarter	0	1	0
,, Wheat Meal and Flour, Barley Meal, Oatmeal and Groats, Rye Meal and Flour, Pea Meal, Bean Meal, Maize or Indian Corn Meal, Buck Wheat Meal, and meal not otherwise enumerated ... ... cwt.	0	0	4½
Currants ... ... cwt.	0	7	0
Dice ... ... pair	1	1	0
Essence of Spruce ... for every £100 value	10	0	0
Figs ... ... cwt.	0	7	0
Fig Cake ... ... cwt.	0	7	0
Furniture Woods, unenumerated, not being Ash, Beech, Elm, Birch, Oak, Wainscot ... ... ton	0	1	0
*Ginger, preserved, till 1st July, 1861 lb.	0	0	2
*Hats or Bonnets, till 31st March, 1861 :—			
,, Chip ... ... lb.	0	1	3
,, Bast, Cane, or Horse-hair ... lb.	0	1	3
,, Straw ... ... lb.	0	1	3
*Hops, from January 1st to 31st December, 1861 ... ... cwt.	1	0	0
* ,, from and after 1st January, 1862, cwt.	0	15	0
Malt ... ...quarter	1	5	0
Mandioca Flour ... . cwt.	0	0	4½
Manna Croup ... ... cwt.	0	0	4½
*Marmalade, till 1st July, 1861 .. lb.	0	0	2
Mill Boards ... ... cwt.	0	16	0
Paper, viz.—Brown Paper, made of old rope or cordage only, without separating or extracting the pitch or tar therefrom, and without any mixture of other materials therewith ... ... cwt.	0	16	0
,, Printed, painted or stained paper-hangings, or flock paper ... cwt.	0	14	0
,, Waste paper, or paper of any sort not particularly enumerated nor otherwise charged with duty ... ... cwt.	0	16	0
,, Gilt, stained, coloured, embossed, and all fancy kinds, not being paper-hangings ... ... cwt.	0	16	0
,, Millboards ... ... ,,	0	16	0
Pasteboard ... ... ,,	0	15	0
†Pepper of all sorts ... ... lb.	0	0	6
Pickles preserved in vinegar ... ...gallon.	0	0	1
Plate of gold ... ... oz. Troy.	0	17	0
,, silver ... ... oz. Troy.	0	1	6
Plums—French and Prunellos ... cwt.	0	7	0
,, dried or preserved (except in sugar) not otherwise described ... ... cwt.	0	7	0
* ,, Preserved in sugar, till 1st July 1861 ... ... lb.	0	0	2
Potato flour ... ... cwt.	0	0	4½
Powder—Hair ... ... ,,	0	0	4½
,, Perfumed ... ... ,,	0	0	4½
,, Not otherwise enumerated, that will serve the same purpose as starch cwt.	0	0	4½
Prints and Drawings, viz. :—			
,, Plain or coloured ... ... cwt.	0	16	0
,, Admitted under treaties of international copyright ... ... cwt.	0	15	0
,, Or, and at the option of the importer, Single ... ... each.	0	0	0½
Bound ... ... dozen.	0	0	1½
Prunes ... ... cwt.	0	7	0
Raisins ... ... cwt.	0	7	0
Rice dust for feeding cattle ... ... ,,	0	0	4½
Sago and sago flour ... ... ,,	0	0	4½
Semolina ... ... ,,	0	0	4½
Ships—Foreign-built, of wood, and all ships built of wood in a British possession abroad, on registration as British ships in this country ; no deduction to be allowed on account of engine-room or otherwise ... ... ton.	0	1	0
Spirits or Strong Waters, not being sweetened or mixed with any article, so that the degree of strength thereof cannot be ascertained by Sykes' hydrometer ... ... proof gallon.	0	10	5
,, Of and from a British possession in America, or the Island of Mauritius, and rum of and from a British possession within the limits of the East India Company's charter, in regard to which the conditions of the Act 4 Vict., cap. 8, have or shall have been fulfilled ... ... proof gallon.	0	10	2
,, Rum shrub, cordials, and liqueurs, of and from a British possession in America, or the Island of Mauritius, or a British possession within the limits of the E. I. Company's charter, qualified as aforesaid ... ... proof gallon.	0	10	2
,, Rum of and from any foreign country, being the country of its production ... ... proof gallon.	0	10	2
,, Rum from any country, not being the country of its production, proof gallon.	0	10	5
,, Tafia, of and from any colony of France ... ... proof gal.	0	10	2
,, other spirits, being sweetened or mixed, so that the degree of strength cannot be ascertained, as aforesaid, and perfumed spirits, to be used as perfumery only ... ... proof gal.	0	14	0
Starch ... ... cwt.	0	0	4½
,, Gum of, torrified or calcined ... cwt.	0	0	4½

ARTICLES.		DUTY.		
*Succades—including all fruits and vegetables preserved in sugar, not otherwise enumerated, until 1st July, 1861 ...	lb.	0	0	2
*Sugar—until 1st July, 1861:—				
„ Candy, brown or white, refined sugar, or sugar rendered by any process equal in quality thereto	cwt.	0	18	4
„ White clayed sugar, or sugar rendered by any process equal in quality to white clayed, not being refined, or equal in quality to refined	cwt.	0	16	0
„ Yellow Muscovado and brown clayed sugar, or sugar rendered by any process equal in quality to yellow Muscovado or brown clayed, and not equal to white clayed	cwt.	0	13	10
„ Brown Muscovado, or any other sugar, not being equal in quality to yellow Muscovado or brown clayed ...	cwt.	0	12	8
„ Cane juice	cwt.	0	10	4
„ Molasses	cwt.	0	5	0
Tapioca	cwt.	0	0	4½
*Tea, until 1st July, 1861	lb.	0	1	5
†Tobacco, unmanufactured, stemmed, or stripped	lb.	0	3	0
† „ Unmanufactured, unstemmed...	lb.	0	3	0
† „ Manufactured or cigars ...	lb.	0	9	0
† „ Snuff	lb.	0	6	0
Varnish—containing any quantity of alcohol or spirits	gallon	0	12	0
Vermicelli or maccaroni	cwt.	0	0	4½
Vinegar	gallon	0	0	3
Water—Cologne, the flask (30 of such flasks, containing not more than 1 gallon), each		0	0	6
„ When not in flasks, as perfumed spirits,	gallon	0	14	0
Wood and Timber (23 Vict. cap. xxii.):—				
„ Hewn, viz., Fir	load	0	1	0
„ „ Oak	„	0	1	0
„ „ Teak and Trenails ...	„	0	1	0
„ „ Greenheart	„	0	1	0
„ „ Red and blue gum ...	„	0	1	0
„ „ Stringy bark ...	„	0	1	0
„ „ Mora, locust, and other sorts used in shipbuilding,	load	0	1	0
„ „ Unenumerated ...	„	0	1	0
„ Firewood	„	0	1	0
„ Lathewood	„	0	1	0
„ Masts, spars, and poles	„	0	1	0
„ Sawn or split planed, or dressed	„	0	2	0
„ Hoops	„	0	2	0
„ Shovel hilts	„	0	2	0
„ Furniture and hardwoods ...	ton	0	1	0
„ Stave, not exceeding 72 inches in length, nor 7 inches in breadth, nor 3¼ inches in thickness (except staves for herring barrels)	load	0	1	0
„ Staves exceeding 72 ins. in length, load		0	2	0

WINE CONTAINING LESS THAN THE FOLLOWING RATES OF PROOF SPIRIT, VERIFIED BY SYKES'S HYDROMETER.

From and after 1st January, 1861.		18 Degrees. Duty.		26 Degrees. Duty.		40 Degrees. Duty.		45 Degrees. Duty.	
		s.	d.	s.	d.	s.	d.	s.	d.
Of and from Foreign Countries:—									
Red	gallon	1	0	1	9	2	5	2	11
White	gallon	1	0	1	9	2	5	2	11
Lees	gallon	1	0	1	9	2	5	2	11
The growth and produce of a British Possession:—									
Red	gallon	1	0	1	9	2	5	2	11
White	gallon	1	0	1	9	2	5	2	11
Lees	gallon	1	0	1	9	2	5	2	11

When imported in bottles, and containing less than 40 degrees of strength, to be charged 2s. 5d. per gallon.

Wine containing 45 per cent. of proof spirit and upwards, to be charged as mixed spirits.

Home Correspondence.

ARRANGEMENT IN THE FORTHCOMING EXHIBITION OF 1862.

SIR,—As I was unfortunately prevented from being present at the discussion of my paper last week, I venture to trouble you with a few lines in reference to the discussion.

In reply to Mr. Cole, I would suggest that, if the exhibitors are to be left to arrange and place their collections according to their own ideas of value and interest, the result can only be a scramble for what are considered the best places, and a vast accumulation of valuable material rendered utterly valueless for want of system. I may also remark that I appreciate, perhaps, as highly as Mr. Cole himself, the advantage of obtaining the services of exhibitors to arrange for themselves, and to elect for themselves, where their collections shall appear, but this is by no means inconsistent with the establishment of a system by which the framework of arrangement is so far secured that the exhibitor can hardly fail to put himself in the right place. Without this, days may be wasted in the vain attempt to compare the similar manufactures of different exhibitors, or obtain an idea on any subject that could lead to useful results. I regret to observe an idea that seems to prevail, of somthing approaching to antagonism between science and practical results, but I feel sure that neither Mr. Cole, nor any of those who agreed with him, can really mean that science and scientific principles should be ignored in deciding on the principles to be adopted in the arrangement of the coming Exhibition.

I would suggest to Mr. Maskelyne that he should consider how far the exhibition of a superb collection of mineralogical curiosities is consistent with the plan of the proposed Exhibition, were it not enough to remind him of the reply that must be anticipated were application made to remove from this country any of the rich treasures under his charge at the British Museum. It is quite unreasonable to suppose that national collections will be sent out of any country for temporary exhibition abroad. Mr. Maskelyne, however, is prepared to regard accumulation as everything and arrangement nothing—an idea not original, but not at present very generally entertained.

The objection raised by Mr. Hilton is only an illustration of the desirableness of adopting some definite principle of arrangement. The singular production of beautiful candles from dirty mineral is just one of those things that ought to be shown. The exhibitor may and should exhibit his candles in two classes—in one as productions from a certain raw material, in the other as finished manufactures competing with other similar manufactures from different sources.

In conclusion, I venture still to hope that, by a careful consideration beforehand of what ought to be exhibited, and what may be expected to arrive, a definite plan may be prepared in a skeleton form, the final filling up of which may safely be left to exhibitors themselves under reasonable superintendence. I am satisfied, from the discussion that took place, that much remains to be learnt on all sides before the exact plan can be sketched, and I am quite content to have been found fault with by everybody, if, from my imperfect suggestions, a practical result is arrived at.

I am, &c.,

D. T. ANSTED.

Athenæum Club, March 16, 1861.

Proceedings of Institutions.

MANCHESTER MECHANICS' INSTITUTION.—The thirty-seventh annual meeting of the members of this institution was held on Thursday, February 28, in the lecture hall of the institution. The president, OLIVER HEYWOOD, Esq., occupied the chair; and amongst those present were Mr. Wm. Fairbairn, F.R.S., the mayor of Manchester (M. Curtis, Esq.,) Mr. John Heywood, Mr. D. Chadwick, Mr. Pisa, Professor Crace Calvert, Dr. Orges, Mr. R. Rumney, Mr. D. Morris, Dr. Watts, Mr. Edge, &c. Mr. MARSHALL, the secretary, read the annual report, of which the following is an abstract:—"The first topic referred to is the gratifying increase in the number of male members. The number of quarterly male members at Christmas, 1860, was nearly 750 (exclusive of boys in the day school), against 600, the number at the same period in 1859. The number of pupils in the boys' day classes is slightly less than last year, but the efficiency of this department of the institution remains unimpaired, as is shown by the results of the last middle-class examinations in connection with the University of Oxford. On that occasion, fourteen candidates from this school went up for examination—three seniors and eleven juniors—of whom seven passed, two of them receiving not only certificates but also prizes. The whole of the candidates passed in chemistry, and several in both mathematics and chemistry, the failure to pass entirely being in most cases due to a break-down in the preliminary examination. As many candidates from this school passed in chemistry as passed in that subject collectively in Birmingham, London, Leeds, and Liverpool. In the ladies' day classes the numbers are about the same as last year, and the only topic worthy of special remark is the resignation of Miss Pilcher, the late lady principal, to whose long and valued services in connection with the institution allusion is made in suitable terms. The evening classes have been unusually active during the winter, the total number of names on all the class books being scarcely short of 2,500. The classes for writing, reading, elementary arithmetic, dictation, and elementary science, have been especially crowded, and the members are congratulated on the fact that, in this department, the institution is doing its legitimate work, viz., imparting instruction to working men and youths. The mechanical drawing class has almost doubled its numbers, and the French and German classes are also larger and more active than for some time past. Reference is then made to the recent establishment of free classes, conducted by gratuitous teachers. To Mr. Henry Pitman is due the credit of originating the movement, and his class for the study of phonography, numbering over 200 members, has been quite a feature in the institution during the winter. A similar class for the study of chemistry has also been established, the directors having been able to avail themselves of a kind offer of gratuitous teaching received from Mr. John Angell; it numbers about sixty members. Another free class for learning to sing on the tonic sol-fa method, with about seventy members, has been established under Mr. R. Griffiths, another gratuitous teacher; and the members are recommended to pass a cordial vote of thanks to the whole of the gentlemen named. The examinations in connection with the Society of Arts are next adverted to. The directors conclude their survey of the year's educational operations with a eulogy upon the zeal and fidelity displayed by the teachers and professors in the discharge of their important duties. In connection with the library, the issue of the new catalogue is mentioned, and also the fact that the subscription to Mudie's library has been doubled during the past year, with obvious advantage to the convenience of the members. The circulation of books during the year has considerably exceeded that of 1859, while the demand for works of fiction has fallen off. The exhibition of dissolving views, commenced in December, 1859, yielded altogether a net profit of about £300, —a favourable result, considering the absence of novelty, and the many adverse circumstances that had to be contended against. The directors, after careful deliberation, resolved to discontinue the exhibition during the present winter, and to devote the energies of the management to the legitimate work of the institution. Of the wisdom of this decision, the prosperous state of the classes during the winter may be taken as some guarantee. The Christmas party, held in December last, was designed to effect some improvement in the funds of the institution, and it is to be regretted that the excellent programme provided for the occasion failed to attract so many visitors as had been relied upon. The formation of a gymnasium and a gymnastic club is referred to, as supplying a want long felt and pointed out. The club now numbers nearly seventy members, and is governed by its own committee and officers, two only of the directors of the institution being members of the committee *ex-officio*. The report concludes with a reference to the balance-sheet, the net financial result of the year's operations being a loss of £139 13s. 6d. The extraordinary expenditure in connection with alterations and repairs, however, sufficiently accounts for the deficiency. The directors conclude their statement with the earnest expression of opinion that the extinction of the mortgage debt, and the consequent removal of the interest charges, is a measure demanding the serious attention of the managers and friends of the institution.—The Secretary also read the statement of the income and expenditure, from which it appeared that the income for the year had been £3,631 14s. 7d., and the expenditure £3,771 8s. 1d., showing an access of expenditure over income of £139 13s. 6d.—The CHAIRMAN moved the adoption of the report. He said the report commenced with stating that the male members had increased from 600 to 700, and ended by telling the incoming board of directors that there was one matter that weighed heavily upon them—that was the debt of £2,000 upon the institution, which it was essential to the prosperity of the institution should be removed as speedily as possible. He then commented upon the leading points of the report, and concluded by wishing prosperity to the institution.—Mr. JOHN HEYWOOD seconded the resolution.—The MAYOR of MANCHESTER moved a vote of thanks to the members of the retiring board of directors.—Councillor CHADWICK seconded the resolution. Whilst thanking the retiring directors, he expressed a hope that the incoming directors would do better than the directors of last year, and not leave a debt of £139 on the year's working. He suggested that there should be an amalgamation of the Mechanics' Institution and the Working Men's College, as a union of the two institutions in Salford had led to uninterrupted prosperity.—The resolution was carried.—Professor CRACE CALVERT moved a vote of thanks to those who had during the last year given donations to the library and other departments of the institution.—Mr. DAVID MORRIS seconded the resolution, which was carried. —Mr. R. RUMNEY moved a vote of thanks to several gentlemen for services rendered.—The resolution was seconded and carried; and a vote of thanks to the chairman terminated the proceedings. The following resolution was also passed with applause:—Moved by WM. FAIRBAIN, LL.D., F.R.S., and seconded by Dr. JOHN WATTS:—"That the best thanks of this meeting be given to Messrs. Pitman, Angell, and Griffiths, for their valuable services in connection respectively with the free phonography, chemistry, and singing classes."

MEETINGS FOR THE ENSUING WEEK.

MON. ...Actuaries, 7. 1. Mr. Porter, "A Communication from Mr Gompertz." 2. Mr. Sprague, "The Graduation of the series giving the Expectation of Life, and the Nature of the Corresponding Curves."

Geographical, 8½. 1. Mr. F. T. Gregory, "Report on the Organisation of the Exploring Expedition from Perth to the N.W. Coast of Australia." 2. Mr. A. C. Gregory, "Memoranda on Ports of N.E. Australia," with "Report

on Exploring Expedition to the Burdekin River," by Mr. J. W. Smith. 3. "Expeditions in South Australia, by the Governor, Sir R. Mc Donnell, and Major Warburton."
Medical, 8½. Mr. J. Gay, "On Abdominal Bands as Causes of Intestinal Obstruction."
TUES. ...Civil Engineers, 8.
Medical and Chirurg., 8½.
Zoological, 9.
WED. ...R. Soc. Literature, 4½.
Archæological Assoc., 8½.
THURS...Roy. Soc. Club, 6.
Philological Club, 8.
SAT. .....Chemical, 8. Anniversary.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 1st March, 1861.

Par. Num.

29. Railway and Canal Bills (24. Exeter and Exmouth; 25. Great Northern and Western of Ireland; 26. Great Northern (Doncaster to Wakefield) (Purchase of Hertford, &c., Railway); 27. Great North of Scotland; 28. Hereford, Hay, and Brecon; Horsham and Guildford Direct; 29. Inverness and Aberdeen Junction, &c., &c.; 30. Kilrush and Kilkee, and Poulnasherry Reclamation; 31. Kirkcudbright; 32. Lancashire and Yorkshire (Branches to Shawforth, &c.) (Extension to Settle) (New Line, &c.) (Wigan to Clifton, &c.), 33. Leeds, Bradford, and Halifax Junction; 34. Leven and East of Fife (Amalgamation, &c.) (Extension, &c.); 35. Limerick and Foynes; 36. Llantrisant and Taff Vale Junction; 37. London and North Western, Lancaster, and Carlisle and Caledonian; 38. London and North Western, and Manchester, Sheffield, and Lincolnshire (Manchester London Road Station); 39. Ludlow and Clee Hill; 40. Lynn and Hunstanton; 41. Manchester, Sheffield, and Lincolnshire (Additional Works) (Manchester Extension); 42. Margate (Ramsgate Extension) (Marton and Harbury);—Board of Trade Reports.
40. Bills—Metropolis Local Management Acts Amendment.
41. „ Metropolis Local Management Act (1855) Amendment.
46. „ Recovery of Debts.
47. „ Valuation (Scotland) Acts Amendment.
50. „ Smoke Nuisance (Scotland) Act Amendment.
51. „ Constructive Notice Amendment.
52. Indictable Offences (Metropolitan District.)

SESSION, 1860.

545 (1). Navy (Gun and Mortar Boats)—Supplementary Appendix to the report.

Delivered on 2nd and 4th March, 1861.

49. Poor Rates—Return.
62. East India (China War)—Return.
38 (1). Trade and Navigation—Accounts (31 January, 1861).
66. Committee of Selection—Third Report.
65. Railway and Canal Bills—Second Report from Committee.
63. Mr. Turnbull—Copy of Correspondence, &c.
70. Harbour, &c. Bill (Mersey Docks and Harbour; 1. Upper Mersey Dues; 2. Kingston-upon-Hull Docks (Capital) (New Works), Hull West Dock; 3. New Ross Port and Harbour); —Board of Trade Reports.
60. Local Acts. 1. Blyth and Tyne Railway; 2. Cleveland Railway; 3. North Eastern (Blaydon to Conside) Railway; 4. Lancashire and Yorkshire (Wigan to Clifton) Railway; 5. Manchester, Sheffield, and Lincolnshire (Additional Works) Railway; 6. Monmouthshire Railway and Canal (New Lines, &c.); 7. Newcastle-upon-Tyne, Derwent, and Weardale Railway; 8. South Eastern (Folkestone Harbour Communication) Railway; 9. Southampton and Netley Railway; 10. South Wales Mineral Railway; 11. Kilrush and Kilkee Railway and Poulnasherry Reclamation; 12. Nanttle Railway)—Admiralty Reports.
29. Railway and Canal Bills. 43. Mid Devon and Cornwall; 44. Midland (Additional Powers) (Ashchurch and Evesham Line) (Otley and Ilkley Extension) (Tibshelf and Nuneaton) (Whiteacre and Nuneaton); 45. Mold and Denbigh Junction; 46. Monmouthshire Railway and Canal (New Lines, &c.) (Purchase, &c.); 47. Much Wenlock, &c.); 48. Nantlle; 49. Nantwich and Market Drayton; 50. Newcastle-upon-Tyne, Derwent, and Werdale; 51. North British and Peebles; 52. North Eastern and Newcastle-upon-Tyne and Carlisle Amalgamation; 53. North Eastern (Blaydon to Conside) (Castleton and Grosmont Branch, &c.) (Extension to Otley, &c.); 54. North London (Branch to the City) (Widening); 55. North Somerset; 56. Oldham, Ashton under-Lyne, &c.; 57. Oswestry and Newtown (Branches, &c.); 58. Oswestry, Ellesmere, and Whitchurch; 59. Portadown, Dungannon, and Omagh Junction, Rathkeale and Newcastle Junction; 60. Rhymney (Additional Capital) (New Lines, &c.,) (Lease, &c.); 61. Ross and Monmouth; 62. Sherborne; 63. Shirley; 64. Shrewsbury and Welchpool; 65. Shrewsbury, Oswestry, and Ellesmere; 66. Sittingbourne and Sheerness; 67 Sneyd's Branch; 68. Somerset Central; 69. Southampton and Netley; 70. South Eastern (Capital, &c.) (Folkestone Harbour, etc.); 71. South Wales Mineral; 72. Stockton & Darlington (New Railway at Maske and Skelton, etc.); Stockton and Darlington, South Durham and Lancashire Union, etc. Amalgamation; 73. Stourbridge (Extension to Smethwick); 74. Strathspey; 75. Swansea and Neath; 76. Swansea Harbour Trust; 77. Swansea Vale; 78. Vale of Clwyd; 79. Walton and Edgehill Junction; 80. Ware, Hadham, and Buntingford; 81. Waveney Valley; 82. West Midland (New Line, etc.); 83. Whitehaven, Cleator, and Egremont; 84. Witney; 85. Worcester, Bromyard, and Leominster; 86. Workington Tidal Basin and Railway;—Board of Trade Reports.
49. Bill;—Local Government.
Tariffs (Foreign Countries);—Return.

SESSION, 1860.

383. (A IX). Poor Rates and Pauperism;—Return (A).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March 15th*, 1861.]

Dated 2nd January, 1861.

7. D. A. Johnsen, Chelsea, Massachusetts, U.S.—An improved method of constructing wooden wheels. (Partly a com.)

Dated 19th January, 1861.

156. W. Clark, 53, Chancery-lane—Imp. in compass protractors. (A com.)

Dated 29th January, 1861.

236. W. Smyth and M. Wasley, Carnarvon—Imp. in the mechanism or apparatus for crushing or breaking up ores, stones, and other hard substances.

Dated 12th February, 1861.

350. S. Frankau, Bishopsgate-street Within—An improved cigar or pipe rack, which is also applicable for other purposes.
358. W. Maltby, De Crespigny-park, Camberwell—Imp. in the process of manufacturing a glutinous or viscous substances to be used in dressing textile fabrics, and for other such like processes, or in brewing and distilling, and also in the apparatus to be used for the same and similar purposes.

Dated 13th February, 1861.

374. A. Ripley, 42, Bridge-street, Blackfriars, and W. H. Stevenson, Duke-street, Adelphi—Imp. in the method of manufacturing, and in the mode of constructing and forming pistons and piston-rods.

Dated 14th February, 1861.

376. T. Cobley, Meerholz, Germany—Imp. in the manufacture of white lead, zinc white, and glazing or potters lead.

Dated 21st February, 1861.

426. F. D. Blyth, 113, Fenchurch-street, and J. Adair, Crane-court, Fleet street—Imp. in machinery for forging nails and other articles. (A com.)
428. J. Dutilleul, 333, Rue St. Martin, Paris—An improved alarm whistle applicable to steam boilers, and indicating the level of the water therein.
434. J. J. Watts and S. Harton, 61, Shoe-lane—Imp. in the manufacture of music plates.

Dated 22nd February, 1861.

450. W. Walker, Liverpool—Imp. in rocket guns and rocket harpoons, and appendages to be used therewith. (A com.)

Dated 25th February, 1861.

487. J. Young, Limefield, Edinburgh—Imp. in heating apparatus.

Dated 26th February, 1861.

486. J. H. Bartholf, King-street, Holborn—An improved construction of rocking horse. (Partly a com.)

Dated 27th February, 1861.

500. W. Whalley, Manchester—Certain imp. in machinery for carding cotton and other fibrous substances.
502. H. J. F. H. Foveaux, Strand—Imp. in specula, and in plugs used in connection therewith.
506. J. Taylor, jun., Roupell-park, Streatham, Surrey—Imp in the construction of roofs for buildings, and in the manufacture of tiles suitable for use for this and other purposes.
508. M. Henry, 84, Fleet-street—Imp. in photography. (A com.)

Dated 28th February, 1861.

511. E. Brasier, Victoria-road, Deptford—Imp. in machinery for treating flax, hemp, New Zealand flax, Spanish or China grass, and other vegetable fibres.
513. W. J. Hay, Southsea, Hants—An improved glue or composition suitable for covering the caulking of ships and other like purposes, for uniting wood and other substances, for filling up seams, and for use as a waterproof glue or composition generally.

514. **R. Laing, Ince, near Wigan, Lancashire**—Imp. in the treatment of certain ores containing metals, and in obtaining products therefrom.
515. R. Whittam, Accrington, Lancashire—Improved modes of heating the feed water of steam boilers.
516. J. Wilson, Manningham, near Bradford—Imp. in means or apparatus employed in sawing wood.
517. T. Newton, Long acre—Imp. in the accoutrements of horse soldiers' and other saddles.
518. C. Beslay, Rue Menilmontant, Paris—Imp. in the manufacture and renovation of woven fabrics.
519. R. Thompson, New Charlton, Kent—Improved machinery for cutting or sawing wood, stone, or any material capable of being cut or sawn by a rapid reciprocating motion of the cutting or sawing blades.
520. W. Rose and T. Crowder, Wapping—Imp. in apparatus employed for raising and supporting ships and vessels.

Dated 1st March, 1861.

521. W. Galloway and J. Galloway, Manchester—Imp. in moulding wheels and other metal articles.
522. J. W. Mott, Lea Bridge-road, Clapton—Imp. in purses, bags, reticules, pocket books, dressing cases, and other similar portable receptacles.
525. E. T. Hughes, 123, Chancery-lane—Imp. in time pieces. (A com.)
526. G. Smith and J. Carrick, Glasgow—Imp. in commodes or closets, and in bathing, washing, and other sanatory apparatus.
527. R. Howorth, Blackburn—Certain imp. in the manufacture of healds for weaving, and in the machinery or apparatus connected therewith.
528. L. L. Sovereign, 302, Strand—An improved agricultural implement for cultivating land and for sowing seed. (Partly a com.)
529. M. Henry, 84, Fleet-street—Imp. in distilling and rectifying, and in apparatus employed therein. (A com.)
530. E. Birch, 43, Parliament-street, and H. D. Mertens, Margate—Imp. in the permanent way of railways.

Dated 2nd March, 1861.

531. J. Ellis, J. Stringer, and J. Bradock, Droylsden, Lancashire—Certain imp. in apparatus for lubricating the piston rods, valve rods, pistons, and valves of steam engines, and other rods or straps to which a to-and-fro motion is given.
532. A. K. Irvine, Glasgow—Imp. in apparatus for stamping or marking letters or similar articles.
533. R. Griffiths, 69, Mornington-road—Imp. in the arrangements and construction of armour or iron clad steam or other ships.
535. W. Hendry, 220, Thistle-street, Hutchesontown, Glasgow—Imp. in the building of boilers and boiler flues for the consumption of smoke.
536. E. J. Hughes, Manchester—Certain imp. in knitting machines. (A com.)
537. C. Stevens, 31, Charing-cross—An ointment for the cure of sores. (A com.)
539. G. G. Sanderson, Park Gate Iron Works, near Rotherham—Imp. in furnaces used in the manufacture of armour plates for ships and other structures.
540. J. B. Chaussenot, 4, South-street, Finsbury—An improved apparatus for drawing off smoke and gases.
541. S. Botturi, Islington—Imp. in apparatus for weaving.
542. W. E. Newton, 66, Chancery-lane—Improved machinery for folding paper. (A com.)

Dated 4th March, 1861.

543. E. Sabel, Moorgate-street, London—Improved apparatus to be used in the manufacture of paper, applicable also to controlling the motion of travelling webs and fabrics. (A com.)
545. J. James, Princes-street, Leicester square—An improved instrument for sharpening slate-pencils, black-lead pencils, lead pencils, crayons, and such like articles.
547. S. A. Emery, Arundel-street—Imp. in portable apparatus for transporting locomotive engines and trains from one line of rails to another.
548. R. Murphy, Crumlin-road, Belfast—Imp. in looms for weaving.
549. H. Hirsch, Bridge-road, Lambeth—Imp. in insulating and covering the conducting wires used for telegraphic purposes.
550. G. Wilson, jun., Sheffield—An improved construction of railway buffer.
551. A. V. Newton, 66, Chancery-lane—An improved construction of hook for hook-and-eye fastenings. (A com.)
552. W. E. Newton, 66, Chancery-lane—Imp. in machinery for making bullets. (A com.)
553. W. Kay, Bolton-le-Moors, and I. Kay, Lever Bridge, near Bolton-le-Moors, Lancashire—Imp. in machinery for doubling and double twisting yarn.

Dated 5th March, 1861.

555. T. Scott, Newcastle, Down, Ireland—Imp. in the construction of roadways and tramways.
556. E. Whittaker and J. Clare, Hurst, Lancashire—Imp. in machinery or apparatus for preparing cotton or other fibrous materials to be spun.
557. W. H. Haseler, 42, Vyse-street, Birmingham—Imp. in joints or hinges for jewellery and other articles having or admitting of metal joints or hinges, also for improvements in the manner or means of suspending such articles by or with such joints or hinges.
558. J. M. Carter, Somerset-house, Monmouth—Imp. in boots or other coverings for the feet.
559. G. H. Birkbeck, 34, Southampton-buildings, Chancery-lane—Imp. in pistons for pumps, steam engines, or other purposes. (A com.)
560. R. Brearley, jun., Batley, Yorkshire—Imp. in treating woollen union and cloths for surface finish.
561. E. Alcan, Coleman-street-buildings—A method of simultaneously marking and piercing or perforating plates of metal, cardboard, paper, and other material employed in looms for weaving figured fabrics. (A com.)
562. C. Hanson, Haymarket—An improved method of igniting or firing gunpowder, gun cotton, and other like explosive compounds in large and small fire arms and ordnance, applicable also to the firing of explosive compounds generally.
563. A. V. Newton, 66, Chancery-lane—Improved machinery for forging horse-shoe nails, spikes, and other like articles. (A com.)
563. W. E. Newton, 66, Chancery-lane—An improved fastening for buttons, studs, breast pins, brooches, and other articles. (A com.)
566. A. G. Corbett, Glasgow—Imp. in constructing and draining floors, suitable for stables and other places.
567. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in apparatus for administering medicated and voltaic baths. (A com.)

Dated 6th March, 1861.

568. Capt. G. B. V. Arbuckle, Charlton, Kent, and T. Scott, Bedford street, Middlesex—An imp. in the locks of fire-arms.
570. J. Statham, Salford, and W. Statham, Openshaw, Lancashire—Certain imp. in machinery or apparatus for mowing and reaping.
572. G. Eskholme, Rotherham—Imp. in apparatus for regulating the supply of water to water closets, and for other purposes where an occasional or intermittent supply is required.

PATENTS SEALED.

[*From Gazette, March 15th*, 1861.]

March 15th.

2264. H. Stead and H. Gledhill.
2266. E. J. Hughes.
2270. D. Miller.
2272. R. Reece.
2273. R. J. Cole.
2277. R. J. Cole.
2285. A. W. Williamson and L. Perkins.
2287. T. Briggs.
2289. J. H. Taylor.
2291. R. A. Brooman.
2292. J. Cash, and J. Cash, jun.
2295. T. Westhorp.
2296. T. Richardson and M. Prentice.
2297. J. R. Morley.
2300. D. Mubray.
2301. C. B. Rogers.
2302. A. A. Trinquier.
2312. J. Tomlinson.
2316. J. H. Tuck.
2388. C. Mather.
2462. C. Wheatstone.
2751. J. Rollinson and W. Rollinson.
2887. T. Benton.
2978. J. H. Johnson.
3059. A. Verwey.
3075. J. Jackson.
3152. A. V. Newton.
3192. H. Chamberlain.
86. R. Smellie.
87. M. A. Muir and J. McIlwham.
93. J. Gibbs.

[*From Gazette, March 19th*, 1861.]

March 19th.

2315. J. J. Rowley.
2338. F. W. Daehne.
2340. J. McCrossan.
2362. H. Offergeld.
2364. T. Robinson.
2397. J. W. Greaves.
2519. W. E. Newton.
3071. J. Chubb and E. Hunter.
3076. J. P. Baragwanath.
3155. C. H. Adames and C. Whitehouse.
107. J. H. Johnson.
127. J. Batley.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, March 15th*, 1861.]

March 12th.

548. W. Ward.

March 13th.

518. J. C. Martin.
561. A. A. Croll.

[*From Gazette, March 19th*, 1861.]

March 14th.

532. D. Gallafent.
538. W. S. Clark.
560. A. V. Newton.

March 13th.

578. L. Cowell.
587. W. E. Newton.
631. F. Haeck.
651. B. Burrows.
653. J. Welch.

March 16th.

564. H. Brocklebank.
569. T. C. Medwin.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, March 15th*, 1861.]

March 13th.

641. G. H. Barth.

[*From Gazette, March 19th*, 1861.]

March 14th.

658. C. A. B. Chenot.

March 16th.

646. J. Hick.